

FEBRUARY 15 GENTS





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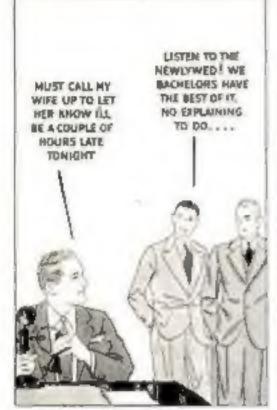
MECHANICS

HOME WORKSHOP

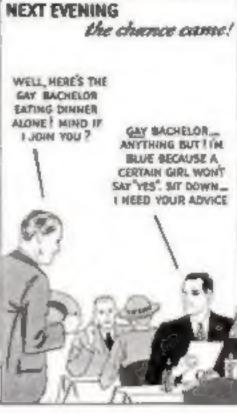
MONEY MAKING IDEAS

350 PICTURES

### WHY HE WAS A BACHELOR



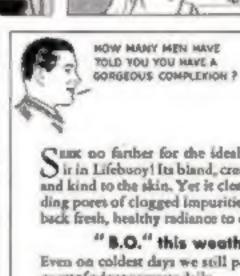












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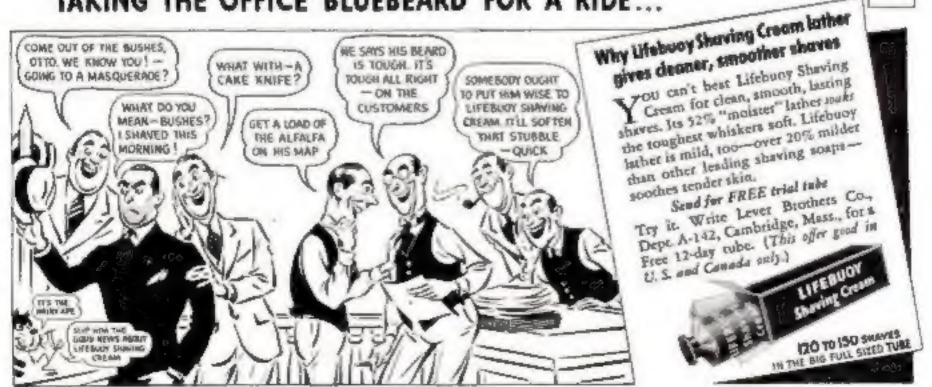


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### TABLE OF CONTENTS for FEBRUARY, 1935

Can Science Raise the Dead?	•	•	٠	•	п
Clever Detectives Solve Secrets Hidden in Wood  How ingenious foresters aid in ferreting out crime, told by K. Y. SANDORN		٠		٠	14
American Devil's Island Holds Toughest Prisoners .  An astonishing trip with Annuew R. Boone to Uncle Som's escape-proof jail					20
World's Biggest Bridge Rests on Sunken Skyscrapers  Perils of sinking gigantic piers overcome by resource/ulness of engineers	,	×			22
How Radio Stars Hear Themselves	*	*	٠	•	24
Fleet of Antique Cars is Big Money Maker	•	•	•	•	32
Triumphs of Science Make Ice Hockey Big Business EBWIN TEALE pays an exciting visit behind the scenes of winter's fastest sport	•	٠	•	٠	42
New Kind of Planet Finder You Can Make at Home					54

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### FEATURES AND DEPARTMENTS

Cutting Your Fuel Bills	6
Our Readers Say	8
The Man With the Net	
Microscope Shows Plant Feeding	38
Weird Stunts with Chemicals .	44
Home Tests of Science Problems	53
Band-Spread Radio Receiver	56
Kinks for Radio Fans	58
Here's the Answer	59
Does Your Car Need Piston Rings?	60
The Home Workshop	61
The Month's Best Auto Ideas .	77
Editing Your Movie Films	78
Coper design by EDGAR F. WITTMAC	K

AUTOMOBILES	
Amphibian Automobile	16
Accessory Prevents Cold Feet .	16
"Auto" Russ on Two Wheels	18
Blanker Stope Auto Pires	31
New Pump Serves Motor Oil , .	34
Runs Fifty Miles on Gallon	40
Auto Key Can't Be Forgotten	41
Robot Warms Up Engine ,	41
Lights Show Speed of Auto	47
Trailer Has One Wheel	45
Hidea Radio Under Floor	57
AVIATION	
Hybrid Balloon Aida Traffic Study	16

AVIATION	
Hybrid Balloon Aide Traffic Study	16
Three-Wheeled Amphibian	27
Rainproof Window for Planes	35

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### POPULAR SCIENCE MONTHLY FOR FEBRUARY, 1935

Bird Leads Glider	NEW PROCESSES AND INVENTIONS	Odd Whisele Tens Benadeasts 41
		Stamps Show Next War 41
MODELS	Two-Purpose Dog Bed 16	Music by Robut Insect 46
	Improved Saw Filer	Astronomers Use Colweb 47
Bakima Boy's Model Domisk 18	Handy Pourotain Brush 18	Cope Photograph Accidents 48
Model Railway Fills Basement , 36	Strenge Gear for Bike Wheel 18	
Streamlined Train Mudel	Flagpule Easy to Paint 18	CRAFTWORK
Tional Fost Protects Radroca 69	Electric Robot Trains Singers , 19	Unique Canters Care 65
Ridding Our Privatner Model 72	New Paralysis Vaccine 29	Dyeing Cord for Craftwork 69
Fiction's Most Famous Ship 82	Insulated Test Pliers	Electric Bunga Cluck 74
Our Ship Model Kits 102	Dogs Get Distemper Serum 30	Iron Silhoustes
	Life Belt Has Light	
PHOTOGRAPHY	Current Heats Ladle 30	Waxing Square-Knot Cord 92
Flattening Photos	Machine Teaches Golf 31	WOODWORKING
	Pocket Mater Tests Lights 40	
Box for Enlarging Paper	Gauges Ripercess of Sugar Cone . 40	Small Table in Modern Style 61
Lens Hood from Inner Tube	Motor Cycle Can't Tip Over 41	Bobsled Building 67
Photographing Shiny Objects	Poging Russ on Liquid Air	Home Wackshop Blueprints 84
Keeping Air from Developers al	Indoor Clock Strikes Chines 16	Chest for Family Silverware 88
Attuching Objects to Glass81	Range Finder for Hunters 47	
Soltening Enlargements 185	Fire Escape "Slide for Life" 47 Odd Telephone Reminder 48	IDEAS FOR THE HANDY
	Bulb Breaks In Pipe	MAN
NEW DEVICES FOR	Dato press til tobe 1	Tuh Holds Shoe Polishes 64
THE HOUSEHOLD		Unique Terracium and Aquarium 66
Lamps Built lote Chair	UNUSUAL FACTS AND	Stencils for Small Designs
Softens Hurd Water	IDEAS	Ingenious Toy Submarine 68
Nipple Screws On	Electric Locomotives Strengtlined 17	Repairing Broken Combs 66
Knocker Lights Door 42	Novel Horizontal Telescope 17	Tacking Labels on Wood
Robots Cantrol Windows 42	Radio Hames Study Television , 18	Tray Moldings Made on Latho 69
Reflectors for Shaving 42	Coasting with Paraclinte 28	Check Your Shop Lighting 70
Clinker Tongs , 42	Old Glass Organ Still Used 29	Homeworkship Guild News 78
Paper Holds Coffee Grounds 43	Explosives Truck Explodes 30	Whisling Thermometers 83
Corner Shields Aid in Cleaning . 43	Mike Reveals Speech Befeets 31	Repairing Alarm Clocks 85
		High-Frequency Experiments A 86
Tongs for Ice Cubes 43	All Shipshape	
Boun Slicer Clampy to Tubbe 43	Shouts Fish Under Water M	Rubber-Stump Printing 87
Now-Style Cooky Cutter 43	Gasproof Shelter in Cellar	Nouslip Cost Hooks 87
Handy Ruck for Drying 43	Speedy Wrapping Paper	Old Bill Says
Safety Nuth Grip 45	Queerest Railway 35	Cork Improves Table-Tennis But 10k
Pot Keeps Coffee Warm 43	Bats Feed on Fish 40	Eyeshield for Brass Turning . , 105

In This Issue—Hundreds of Fascinating Articles Tell the Latest News of Laboratory Discoveries, Scientific Triumphs, and Amazing New Inventions

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Course Valentines sometimes burt your feelings, but many of them teach important lessons. Here's one for every man who is exceless about shaving. If you know one who neglects his heard—appears in public with stubble on his face—why not do him a real favor by mailing him this Valentine? It might do a lot of good. For apparently some people still don't realize that bristles are repulsive—make a man look untidy, ill-kept and often lose him the respect of others.

Today there is absolutely no excuse for neglect. Any man with a normal skin can shave daily or twice daily in perfect comfort if he uses the Gillette "Blue Blade". This blade is especially processed for quick, easy strokes on sensitive faces. Its edges are smooth—automatically ground, honed and stropped by methods not to be compared with those used by any other manufacturer.

The Gillette "Blue Blade" is rustresisting, tempered by exclusive process and is "anchored" in its envelope so it reaches you undamaged —as keen as it left the factory.

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They tell us Fred is a dog-lover, but they can't tell us he's a pipe-lover or he'd groom his briar now and then and switch to a pleasanter tobacco. Like Sir Walter Raleigh. This unusual blend of friendly Kentucky Burleys has trotted to the front rank in popularity because it really IS milder, cooler, delightfully fragrant. Try a tin . . . and hear your friends yelp for joy!

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It's 15 -AND IT'S MILDER



Insulation can be poured into the walls of a house, as shown at right, simply by opening holes in the walls large snough to admitthe opposition of the the material is forced. Below, fill-type insulation is being blown into artic floors to prevent loss of heat through roof



# Cutting Down Your Fuel Bill

HERE dollars and cents are concerned, the average home owner usually is a good business man. He bargains for the best in repairs, saves in gas and electricity, and buys only where quality is high and prices low. Yet, in two cases out of three, he ignores hidden leaks in his heating system that are robbing him of at least a dollar every winter week.

In most bomes, fully fifty cents out of every dollar spent for taxes and general operating expenses goes for heat. Figured in cold cash, winter heating is an expensive proposition, but it can be made less expensive if precautions are taken to conserve it and get the most in comfort for every ounce of fuel.

Assuming that you have licked the firebox losses in your furnace (P.S.M., Nov. '34, p. 6), your fight against fuel waste is well under way. However, other tricks, equally simple, will help you to slice even more from your yearly heat bill. First of all, it is false economy to shut down your fire so completely at night that the bouse is thoroughly chilled by morning. Tests. show that fuel is wasted whenever a home is allowed to cool more than ten degrees below its normal temperature. To conserve the heat and allow your furnace to operate at a minimum, be sure that your sleeping rooms are well shut off from the rest of the house and lower the window shades in the remaining rooms to prevent the best from escaping too rapidly through

the window panes. A good thermometer bung in the hall will help you to regulate your furnace so that it is operating well within the efficient ten-degree tempera-

If your beating system is of the steam, hot-water, or vapor type, pay particular attention to your radiators. A mere one eighth inch of dust on the coils can account for a twenty-right percent loss for that particular unit. Even the question of paint has a bearing on radiator efficiency. Contrary to popular belief, metallic paints rob considerably more heat than non-metallic paints, while black is a far more efficient rolor than white.

Should you find that one room in your house is always cold while mother is unbearably hot, try switching the radiators. The exchange may strike a balance. Also, remember that most radiators are sectional, making it possible either to add or remove single sections to supply more or less heat. Of course, before making any radical changes in the system it will be best to find out something about the capacity of your furnace. In most cases

Cayro/rin/ Insertal

your beating contractor can furnish this information.

With pipe insulation selling for as little as twenty cents for three-foot lengths, there is little excuse for the heat that escapes from bare steam or hot water pipes, Losses, which generally run high at this point in a system, can be reduced as much as ninety percent by the installation of modern one-and three-eighths-inch sectional pipe insulation. Elbows and valves can be protected with asbestos furnace cement, obtainable at less than a dollar for twenty-five pounds.

IF OUR homes were built like thermos bottles, our heat-loss worries would end with the furnace and its system of air ducts or pipes and radiators. Unfortunately many homes, even though sturdily constructed, have no more holding power than a sieve where heat and cold are concerned. More than one quarter of the heat delivered by a furnace can be lost through faulty doors, windows, walls, and roof.

Three roads of escape exist at the windows and doors alone; cracks where the door and window frames meet the wall, clearances between the doors or sush and the frame, and the glass window panes

The first point of attack should be the needless cracks between the doors or windows and the wall. If desired, a commercial caulking compound can be obtained from your paint dealer or you can make your own by mixing paste white lead (6 oz.), dry asbestos (9 oz.), whiting (1/2 oz.), linseed oil (1 gill), and enough lamphlack or other pigment to give the compound the desired color. This can be stuffed into the openings.

TWO general types of weather stripping are available to the home owner who wants to eliminate the heat-stealing drafts that seep in through the necessary loose-fitting joints between windows and doors and their frames. Although felt or rubber is the least expensive and easiest to apply, metal weather stripping is entirely within the amateur woodworker's scope and once in place lasts forever.

As for the third road of escape, the glass windows themselves, double sash or storm windows will invasiably stop the loss. By forming an air space, they prevent the conduction of outside cold and inside heat. In most cases, they need not be applied to every window in the house but merely to those facing to the north or northwest.

To prevent the loss of best through walls and roof, insulation is the only solution. No matter how well constructed your house may be, most ordinary building materials are good conductors of heat, passing on to the outside air a great deal

of the costly warmth.

For convenience, insulation is now available in three general forms; Board, consisting of easily sawed and nailed materials in rigid sheet form; mats or felts (sometimes referred to as "bats"), flexible sheets of fibrous material; and fills, a loose form of insulation that generally is blown or poured into the hollow spaces between the study of a wall or the beams of a floor.



### "I'll <u>never</u> let you down"

No matter how big Doris gets, no matter how old, she will always feel that sturdy arm of her father sustaining her, and his loving care on guard.

Let her down? That is not John Roberts' idea of a father's responsibility.

He recently secured an Equitable policy. He arranged that, in event of his death, the proceeds would be paid to his daughter—not in a lump sum, but in monthly instalments throughout her lifetime. His little girl can always live comfortably and, moreover, will be assured of sufficient funds for an education.

### Life insurance made to your measure

The Roberts case is one of many interesting applications of the Equitable Case Method of life incuraces planning. This method makes certain that you get exactly the right insurance to fit your own needs and wishes. Obviously, such an approach often makes the some amount accomplish more.

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Please said a copy of your booklet describing the Equitable Case Method of Life Insurance Planning.

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# Our Readers Real Left-Handed Screw

### Found in Old Stagecoach

You published a wisecrack from G.S.L., Newcastle, Australia, about left-hand screws. Now, I not only know that there are such screws, but actually have some taken from an

old stagecoach. They are three inches long, seven sixteenths of an inch in diameter, and must be turned left to tighten. You illustrated his letter with a kangaroo laughing, but I think the last laugh will be more like a prairie-dog laugh when he sees that we of the American prairies know our threads - at



least, we can see a left-hand screw when it is one, and don't need any other than a righthand delver for it, either, Another thing: almost all East Indian jewelry is made with left-thread screws. I was there six years ago and I know it to be a fact as I have quite a collection of them. Why doesn't O.S.L. tell us some news from his part of the world, or send us a boomerang. That laugh of his is sure going back.—W.C.K., Lamberton, Minn.

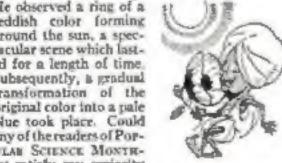
### A Photographer Replies -In the Negative

In answer to the letter of the girl mechanic, M.D.M. of St. Augustine, Fla., suggesting that you give up the photography department, I say, "Nothing doing." Automobiles, airplanes, and Gus of the Model Garage are all good, but photography is the hobby of millions. Look at the business done by the finishing plants. You can carry a camera under your arm and develop your pictures in the bath room. Photography as a hobby is within the reach of every one and the results last a lifetime. Let's have some new tricks-the use of better cameras and ways to take better paclures. It was photography that sold this magazine to me three years ago and I certainly hope you will continue it along the lines suggested above so we can keep on going ahead.-G.A.J., Norwich, Conn.

### Strange Red Ring Forms Around Oriental's Sun

Will you please give space in a corner of Our Readers Say page to this description of a "freak of nature"? The other day a friend of mine was so fortunate as to witness a curious heavenly phenomenon. At 12 30 p.m. the sky

was somewhat cloudy, He observed a ring of a reddish color forming around the sun, a spectacular scene which lasted for a length of time. Subsequently, a gradual transformation of the original color into a pale blue took place. Could any of the readers of Pop-VIAN SCIENCE MONTH-Ly satisfy my curiosity



with a scientific explanation of this rare phenumenon (if, indeed, it is rare)?-S.M.G.,

Deoli, India.

### Science Teacher Asks for More about Electricity

I saw a letter from L.B., Utien, N. Y., in a recent home of Popular Science Monthly, asking for more electrical experiments. 1, too, should like to see a series of articles on area, electromagnets, transformers, resistances, toy motors for direct and alternating currents, and other electrical esperiments that would be of interest to high-school students. I have charge of the science department in the Mountain Home public schools and your magazine has certainly been a help to all my science classes. I have a class studying electricity now and another will be studying it soon. I'm hoping that you'll have a series of articles coming along in time to aid the second class.-L.C., Mountain Home, Ark.

### "Black Lightning" Really Violet, His Photo Indicates

I was interested in the item in your depaztment, Here's the Answer, under the heading "Black Lightning." In 1019 I made a photographic exposure during a summer electric storm in New Mexico. On developing the aexative I found two streaks of lightning which ended in a different color from the one in which they began. As the film was of the old style, which is little sensitive to red, I assume that the light was a deep violet. As a matter of fact. I remember that the

flashes that day were mostly of the lavender and purple kind, instead of the yellow and white. The darker the parple, the more transparent that poetion of the film, as in that part the purple rays obstructed the brighter ones Mumination the background, so that they



could not reach the camera less. That there are dark or invisible rays has, of course, been demonstrated in infra-red photography, and I do not doubt that a film sensitive to red would have shown many more ray recordings, which would have printed out almost black. This is what gave rise to your correspondent's misconception about "black lightning."-H.B., Riverside Canf.

### He Wants Small Models of Crack Atlantic Liners

I stave been greatly interested in Mr. Gommi's instructions for building small ship models. I built the Aquitania from his plans and the result is a beautiful miniature reproduction of that famous liner. Now I must appeal to you for assistance in building a set of the crack Atlantic liners, for which I should like the plans for building models of the Levistkan, Bremen, Rez, Mauretonia, and Britannic, so that the set, when completed, could be put into a case and would make a very interesting and attractive group. I might mention that we hold annually an arts and crafts exbibition, and it is my intention with your issistance to enter a group of models of famous modern liners.-C.S.B., Sydney, Australia.

### A Reader Makes & Design for the Millennium

Theat are certain manufacturers who ought to be strung up for not doing their share towards making life more enjoyable through the medium of their products. What am I driving at? Well, things like these: Why

aren't all dry-goods materials pre-shrunk so that they'll remain the same size after washing? Why aren't all buttons sewn in place with strong thread so they'll stay put? Why doesn't my radio have a volume control that really controls the volume? Clocks should be made



reach- and insect-proof. Women's watches are ridiculously designed, with the dial to small it takes a microscope to read the time. Most mail boxes and in-the-door mail alots are too small to take care of large pieces of mail like magazines, without folding and damaging them. Why should it be necessary to use a crowbar to open a but, train, or trolley window? Tool manufacturers would do well to make took for farmers and craftsmen of a light and rust-proof metal or alloy. And why aren't blocks and other pulleys so designed as to permit the use of a knotted, or at least a neatly spliced, rope? Also it should be a criminal offense for a maker of men's pants to put in them pockets that are not made of strong material. These are only a few of the billionand-one "minor" things that would vastly im-prove living.-A.V., New York City.

### He Travels So Fast He Splits Himself in Two

While we just can't say how it came about, my brother and I got to talking about time and began to figure that if anything could be projected at a speed of 25,000 miles per hour, it would circle the earth in one hour. Increase this speed sixty times and the earth would be circled in one minute. Increase this speed sixty times and the earth would be circled in one second. Again locrease It sixty times and the journey would be made in nothing flat. In-

crease this speed sixty times again and you would gain one second, or in other words, you would get back one secand before you started. It would appear then that it is only necessary to travel at the requisite speed to gain any amount of time you want. Suppose one took such a journey and gained one hour. He



Charge (printed printerial

could come back to where he had been one hour before, and observe himself. When did the split occur? He could prevent himself from starting, but if he did so, he could not he there to prevent himself from starting or to meet himself, which is absurd. Can any kind reader point out the failury?—L.S.H., Philadelphia, Pa.

### Here is How One Reader Trisects Any Given Angle

I have noticed continued interest among your readers in the subject of truecting an angle. I found to a textbook a problem with its answer given as an equation in polar coordinates called the insecurix and said to be the own of the vertex those whose

base AB is fixed and which has the angle A-2x. I tested it out and found it to be true if you place the base AB on the polar axis between the origin and point a. That method didn't satisfy me, however, because the less of the triangle shrink for given angles close to 180 degrees. I



evolved a similar plan in which the less do not abrink. It employs specially drawn curves, one of which is a function of sine of half the angle, and the other (almost a strught line) a function of one sixth of the angle. Both are sine curves. The diagram shows how it is done. Given any angle LQN (less than 180 degrees) and the specially drawn lines indicated. With Q as a center and a radius of two inches, draw the arc LMN and the chord LN. Bisect the angle to obtain the center line QM Place the chord LN perpendicular to the center line of the special figure at the position where the ends of the chord touch the lines AB and AE. The points where the chord cots the lines AC and AD are the projections of the true points of troo tion as no the art LMN Sumpt officer after parameter in the letter ter line t rough both pass a. Where those tion at the air we have be poster if you ... the arc, and consequently the saute, into three equal parts. Always use a two-such radius, untest you enlarge the special figure as you in-crease the radius.-W.F.H., Detroit, Mich.

### His Collection of Models Seems to Be Growing Fait

I'm year finishing the lotest imag of your entra-good enagating. Popular Science Monthly Reep up the dope on thip and coach models. I've built, since May, 1933, the Texas, Indianapolis, Hartford, Manhatten, Scotlytch, Diamond Tally-Ha (Concord stage-coach), and Cody Coach. I am now starting on the Smillow, Give Capt. Armitage M. Canning best regards.— J A.S., Baltimore, Mrt.

### Solution of Right-Angled Triangle Problem Thirty-five Centuries Old

The noution of the "Fatra Square Jork" process is used bost processes. In the case can sometimes be used as equal in the case case majorials not reason solves by other not be exampled in the monopoles are functionally as a few compagning functions. Which are said to be been found to a like an accompany found to a like another the been found to a like another said to be an accompany.

gots and believed to date back to roud if C. I've two larms squares are could not read the transfer are on the hypoteness of a right triangle is equal to the sum of the squares on the other two sides. It also proves graphically that (a+b) a +2ab+b'



I can't understand why this proof is forbidden in our textbooks on geometry.—C W B.,

Crockett, Calif

### Explicit Rules For Fixing Your Erretic Old Clock

IN A preest tone of Philips Scriper Maxima GAG of Printell N. H. asks for informa one on requiring alarm the lat. It is just possible that I can give him the lowthing on clear repaired, as a base repaired. r the log for the years, as you make on and more than that number of close. First per the works out of the use by taking out all the screen in sight. I am with a hood priout the back. It is men had was not 1500 t use force, just hold it up and aggle it Let ... that you don't want it out, and it will fall out. Next, find out what ails the clock bef-reyou fix it. If the manspring is busted, put in a new one. Or, you can wind a fish a se around the exhor shaft, hang a brick on it in a weight, and half the works to the smokehouse door (this method has been known to work; Now check up on the train, Start on the barrel it on laws he center wheel, thank, fourth and evape flowr to the paliet total and aroun Otherse, he around of end and sate stake and catterful to one are undertile magmeter. Be saile in the are said to persendicular and told. Note the design of draw in the entering panet, the art art of look in the doc after and, he end stake of the lapance staff, See U.a. . e. cones are scarpand solidad with sort New observe og acfrom 64 for a sould jung which must be bits room. To such clear the rotary when the our kthat are accusted to the escapement. Now observe the language and see that it is cen-

tered and true. See also that the outside cool vibrates exactly between the cuch plus. Next, pur it in best by rotating the collect on the staff It the clock will new run der hai at at at at I refuses to me boil it in timegar if this does no good, take it all apart, but in putting it together don't get the



management in upoide down, for that would cause it to run backward. It by this time you have decided that you are too busy to fix the clock, put all the pieces into a grape basket or milk pail and cover it well so that the neighbors will think you are carrying east. Sneak late a pewelsy store and explain in detail how the clock angled off the top shelf of the whatnot and landed on the brick that holds the door open. The jeweler won't dispute what you my; he will just make the bill two dollars instead of filty cents. The more rules go for fixing watches, Just because a watch is small is no reason why it can't run as fast at or faster that a clock. I have seen a very small watch beat a town clock by four hours in one might. Regulating it watch to easy. Just tount its beats for three hours. It beats five times a second, 300 a minute, 18,000 an hour 437,000 a day and 157,680,000 a year If it misses two beats in three hours by correct count, turn the timing seven one ten-thousandth of a turn to the right. Hock, it's easy Grab a znoukey wrench and hop to it.-W D G., Essex, lowa.

### Know All Things, Says This Broad-minded Reader

High are some thoughts for the young fellows who want you to give your magazine over exclusively to their particular hobby I am proud of possessing some knowledge of peaches a every scenic. In the rest of carried a every scenic I at the visit of the rate of service to some it are tan remember. Tens at the tare to see a research at my varied conject at long taken to the part even in the protest labors of pantot, gardener and printer's devil in my early days. One cannot learn too much, or of too many different things. For success in the modern world, one

most learn analyze and forget much All fields of knowledge are related. Some knowledge of astronomy may help one in chemistry, in mathematics, in mechanics, and in any other tend—to H.L. Los Angeles, Card.

### It's the Naturalists' Turn To Swallow their Words

What does it take to make a thing a fact? Does hatter take to put on a state performance before a group of hot house scientists to prove it? I admire scientists and their work, but I have no use for those half-baked nuts

who are a way questioning the versities of others who have had years of opportunity to observe the conduct of nature. Just because these fancy naturalists had to see the same thing occur when they put in the rooting, we and go for a majore which they are reads to denounce the test noise.



if serving who have had the experience of a his one has there are knots of sources that take their young into their mouths. Whether this is for protection or to swallow them is the anake's business, for I have even less use for a snake than I have for those auto who try to measure the world with their tongues Scientists-bah I When a lad, I chased snakes and was chased by them. Some anakeologists have stated that no snake can strike beyond ets own length. I poutively know this to be untrue. In the oping of 19.0 I barely escaped being bitten when a small snake coiled and struck at me, clearing the ground for a distance of practically twice its length. Recently one of our know-ft-alls, in a question column in a newspaper, gave this answer in respect to the hoop spake. In all my wide experience I have found no definite proof that the hoop snake ever existed " And, of coome, his experience and opinion carries more weight than the experience of thousands through the past centuries. We have people at Zion City, Ill., who know that the earth is flat by the same evidence Well, so much for the anakeologists Their wasdom gives me a pain,-F.P., Bloom field Hills, Mich.

### Urges War on Waste of Coal and Oil

We reme ourselves on our scientific inventions to promote efficiency and prevent waste. Yet we are very wastrim of two of our natural resources that cannot be repeated, coal and oil I have yet to learn of one thing that is being done to conserve these resources. Why not require automobiles that cannot make a gasoline mileage fixed by law, to be unked? Why not require acto manufacturers to meet this gasoline mileage in their new cars?— F & Y. Newport News, Va.

### What a Shock to China This Deep Hole Would Be

Here's a question a friend put to me recently. Where does the force of gravity end? Suppose I due a hole right through the earth

and then let a stone fall so that it would drop through the hole. How far would st fall or a witer words where would it stop falling? We could not find an answer and deviced a appear to your reaccess fat their to be us one arrates on the characters fat their to be the characters are arrates on the characters are arrates on the characters are arrates on the characters are arrates to a surround.



interesting I would like more articles of that kind.—G.P.O., Boewaran, Java.



Aboutmet Oil Co

### Fighting the Tides of the Golden Gate

In bridging the Golden Gate at San Francisco, engineers have tackled what is said to be the most difficult underwater construction job ever attempted. This photograph shows theirmmense fender, 1,100 feet from shore, that shelters the base of the southern pier from tidal action

### POPULAR SCIENCE

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RAYMOND J. BROWN, Editor



Can Science

To minimise, surer ed by a) R. L. Lonish, center, in designed to be used in contoring a person to life after apphysication.

Amazing experiments, now being
conducted by experts, indicate the
possibility of starting the heart again
after it has ceased
to function

### Raise the Dead?

N A spotless laboratory three whitegowned men stand around an operating table. On a cloth lies a perfectly sound and healthy terrier.
One of the men fixes a mask over
the don's muzzle white another turns the valve
on a tank of introgen, Its supply of oxygen
cut off by a gas that itself cannot support life,
the dog after a time ceases to move. The muscles relax. The dog is dead.

Then, for what seems an eternity, the whitegowned men busy themselves with hypodermic needles and mysterious liquids in tightly corked vials. Four minutes pass. One of the men looks at his watch. Another fills a needle from one of the containers, then thrusts it into the chest of the dead dog until the point pierces the heart. An oxygen mask is placed over the dog's mussle.

Nerves grow taut as the experimenters strain forward over the dog. A stethoscope is placed over its heart. The man using the instrument gives a cry of excitement. The heart has begun to heat. The dog, dead four minutes, is living again. In a day or two he will take food. Within a few weeks he will walk, run, play and obey commands.

As simply as this is reasted a dream that has fascinated men for centuries. The dead has been brought back to life. True, it is only a



On another mechanical seesaw use of which was recently demunstrated in London persons apps entry arowned are tooked back to life. The up-and-down motion (aduces an imitation of reachiving

dog, but Dr. Rabert E. Cornish, the daring young California scientist who is thus able to thwart death, prophesies that a man, dying similarly of suffocation, can as easily be revived. In Baltimore and Cleveland, in Russia and Switzerland, other accentists, following other lines of research, make the same prophecy. Some of the miracles of the past will, they say, be duplicated one day by science.

A. Johns Hopkins, in Halt more investigators have revived anima's apparently kaled by electric shock. They had been puzzled by the paradoxical fact that low current shocks sometimes cause death. while stronger shocks frequently do no more than momentarily interrupt beart action. Seeking an explanation, they found that light shocks disorganize action of the heart muscles, and these, unable to act in unison, cannot pump blood. The experimenters applied electrodes carrying a current of about one ampere directly to the heart of an unconscious dog. The countershock stopped the disorgenized fluttering and the heart resumed its normal best, restoring the dog to late"

O her investigators in Russia, using an artificial beart invented by Dr. Serge Brok. haneako, succeeded recently in bringing back to some temblance of life a man who had hanged himself. Declared dead for three hours by competent physicians, the stricted a body was harried to the laboralory. There the surgeons slit an artery and a vein, and into each incision inserted tubes leading from the mechanical heart.

The electric motor was started and a pump on the device drew dark blood from the vein. The blood passed through the artificial lungs of the machine, where impurities were removed and the blood charged with oxygen. Another pump then forced the purified blood into the artery. Slowly, as the body cells absorbed the lifegiving oxygen, the man opened his eyes and looked at the doctors about him, as a man in a stupor mucht do. But after two minutes the spark of life flickered out.

The bears machine, right was invented by Dr. Brubhananho, at Museuw II was used at it shows in the Change tion, by not so m heart when conneuted with a dead dog a bead

Just a few days ago, a woman lay on the operating table at University Hospital in Baltimore. An attendant auddenly cried out excitedly that he could not see any pulse in the patient. The surgeon, through an incision already made, thrust his handunder the disphragm and clasped the motionless beart in his fingers. Counting slowly, he alternately pressed and released the heart, keeping the blood flowing through the woman's body. At last the beart began to beat of its own accord. The operation was completed and the Woman recovered.

In Geneva, Switzerland, a persistent scientist experiments with bodies of persons. apparently drowned or abooked to death by electricity. There is no pulse in the hodies or any other sign of life. The experimenter massages the beart lightly for ten or fifteen minutes. In many cases the stilled beart has responded and the man has recovered. A French doctor, although he has not restored life, has made an experiment as interesting. Taking an infant that had been dead for twenty-four bours, he has massaged the beart and caused it to beat of its own power. In Japan, another physteran has done the same with the dead heart of a young boy

Attacking the problem from a different angle, Professor Wuder D. Bancroft, of Cornell, is seeking to postpone death. A simple chemical, known as sodium rhodanate, would, be declares, increase a man's ble at least two years. Taken after a man reaches forty-five, the chemical would

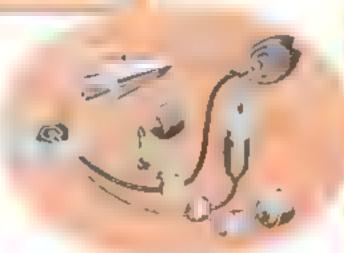
sburply, restoring a normal pulse even after the heart on ils own account has ceased to beat. Following this injection, Dr. Cornish believes firmly that the dead man would live. He does not agree with other scientists that the brain of the man so revised would be hopelessly damaged

slood in circulation.

Brain and nerve tissue un ike less specialized cells, break down rapidly An American authority holds that brain cells begin to fail the moment the heart stops, or even before if the pulse should be greatly enfeebled. A Frenchman sets the time at twenty minutes af ter death. Many scientusts accordingly hold that a man restored to life might be blind, wholly or

This is an on arged trust section of human cel s that ate eti: a two and are throwing out conpactive tursue though they have been sepmared from the partent body for more than a whole year

partially paralyzed or even feeble-minded. Dr. Cornish, in his experiments with dogs, has sought to prove this fear unfounded. Luzarus V, the terrier be asphyx-





prevent hardening of nerve and brain tissue and increase resistance to disease.

Still, the actual restoration of life in a man known positively to be dead has not yet been accomplished. Dr. Cormsh, elated at the sensational success of his experiments with dogs, wants to make the attempt. He is now seeking permission to experiment with a criminal executed by poison gas. Given the body after physicians had declared the man to be dead, he would strap the body to a teeterboard and attach electrical heating pads to the limbs. Next a chemical known as methylene blue would be injected into the veins to neutralize the poisonous fumes that had caused death. Pure uxygen would then be pumped into the lungs through a mask and the teeterboard rocked slowly to keep the

As a last step, the afe-giving fluid would he injected into a large vein, Consisting mainly of human blood, this would contain adrenalm, or epinephrine as it is known in he others last of drugs. This substance, as if magic, causes the heart to contract

iated and then brought back to life after four minutes, has apparently recovered normal intelligence. It was suggested that this restored brain power is merely another example of an animal's ability to act purely on its instincts. Dogs with the gray matter removed from the brain have been taught to respond to certain signals. Laxarus V, however, has gone far beyond this basic evidence of intelligence. Since beginning his second life, he has learned to bark and eat and to stand mone. He has even taken a few wobbly steps.

The groundwork for the methods used by Dr. Cornish were laid unconsciously by a London physician in 1855. The physician, Dr. Thomas Addison, of King's Hospital was interested only in finding a cure for a strange malady. The ailment afterwards known as Addison a disease, affected the heart, gave a copperish that to the skin and left the pulse feeble and irregular. Addison discovered that it was caused by failure of the suprarenal gland. a ductless capsule about two inches long above the kidney. The secretions of this then little-known gland had a mysterious effect on the heart and blood vessels.

Research men soon succeeded in making an extract of the gland. This extract, it was discovered, had also the remarkable power to prevent breeding and for years it was used for this purpose in surgery. But the extract was unstable, when exposed to air it quickly lost its power Scientists in many parts of the world struggled to isolate the active principle of the gland, as chemists in later years extracted the vitamuns from the fats and other matter in cod-iver oi.

Then in 1900 a Japonese scientist, working in America, succeeded almost overinght. Mere chance had led him to undertake the work. He had come to America
ten years earlier to latroduce his own
method of making whiskey. Retained by
a distillery at Peoria, Illinois, he aroused
the jealousy of other distillers and malt
makers and one night his distillery was
hurned to the ground. Discouraged and



REPRODUCING ANCIENT MIRACLES IN THE LABORATORY

Here Dr. Corn share seem working to restore a dead dog to life. The en mal, dead four to neare, were real assumed controlly that it was restored to full health and vigor in a very lew days.

ill, he went to New York and interested a medicine manufacturer in the discovery the distillers had spurned. This manufacturer, like others at the time, was keenly interested in the problem of suprarenal gland extract. He gave the job of todays the active principle to the Japanese,

Setting up a laboratory in the basement of his New York apartment, the latter went resolutely to work and within a few months produced a powder of fine, white crystals that contained the active properties of the gland. It was slightly bitter to the taste and would instantly bleach mucous membranes. Its discoverer, Dr Jokichi Takamine, named it adversalm. Still, for all the importance of his discoverer.

ery, he died in 1922 without knowing that adrenalin, sometimes under other names would one day be used to perform seeming miracles. Not until 1923 in a St. Louis hospital were its amazing potsi natics rearized.

A white-haired old man walked into the hospital critically ill and was operated on at once. Two weeks later a second operation was found necessary. After the anaesthetic had been administered, the old man cessed to breathe and the supersensitive electrocardiograph showed no heart action. Artificial respiration was applied without effect. Surgeons then decided upon what seemed a desperate course. They prepared a solution con- (Communed on page 108)



### Clever Detectives Solve



By K. Y. SANBORN

Hrung Richard Hauptmann in his trial for the kidnaping of the Lindbergh baby is—a piece of wood! Experts of the U.S. Forest Products Laboratory, in Madison, Wis., hence that they have traced the material used in the kidnaper's ladder to a lumber yard in the Bronz, New York City, where the German carpenter was once employed

Early in the investigation of the kidnaping Col. H. Norman Schwartzkopf superintendent of the New Jersey State Police, asked the help of this special division of the Forest Service to developary clues that might be revealed by the ladder. An intensive technical examination by Arthur Koehler, senior wood technologist at the Laboratory, revealed not only the kind of wood used in the ladder, but also certain distinctive and peculiar markings

On the basis of his conclusions as to the causes of these markings. Keehler examined lumber samples from mills scattered from New Jersey to Alabama. The persistence with which be worked and the possible importance of his findings, have attracted nation-wide attention to the seeming miracles that can be performed through wood identification

Wood is a telltale. Let criminals beware of it. It can change its inner structure no more than a leopard can change its spots. Under a high-powered microscope, and sometimes with the use of polarized light, which beings out differences that cannot be seen in ordinary light, wood which has even been ground into sawdust, petrified, or burned into charcoal has been identified by experts at the Forest Products Laboratory Before the Lindbergh kidnaping investigation, Koehler's work in wood identification figured in another sensational case. This was in the so-cailed "Yulebomb" mucder mystery, which occurred in Wood County, Wisconsin. In this case a bomb had been mailed to James A. Chapman, a member of the Wood County Dramage Commission, which had been having sensus disputes over its right to order the dramage of certain farm lands.

At three o'clock on an afternoon two days after Christman, Chapman's grand-son brought into the living room of the Chapman home a package that had ar rived in the rotal mad delivery. Interested in what appeared to be a belated Christman gift, Mrs. Chapman bent over to watch her husband unwrap the package As he united the third of three strings which held it, there was a sudden explosion, shattering his left hand and severely injuring his left leg. Flying pieces from the bomb struck Mrs. Chapman about the head and body, resulting in her death the following day

Suspicion centered on a farmer named Magnuson, who had had violent arguments with Chapman concerning the right of the Dramage Commission to drain a portion of his farm. The case came to trial in the Circuit Court the following March, before a jury of eight men and four women

Exhibit A in the case was a piece of wood about five inches long and one and one fourth inches square. A reconstruction of the bomb had established that it had consisted of a piece of gas pipe inserted in a block of white elm. Charged

Remarkable

with picric acid, the bomb had a metal trigger, or release device, similar to a timing device on a gas engine on the Magnuson place,

Wood shavings found in Magauson's workshop had been exhibited at a preliminary hearing held shortly after Mrs. Chapman's death. At this time Magauson's sawyer had termed a "vaudeville act" the attempt to use these wood shavings to link Magauson with the crime, particularly since the shavings were of oak while the wood used in the bomb was white elm.

Federal Inspectors made a second investigation of Magnuson's workshop. At first the appearance of the shop had borne out Magnuson's claim that he had no white elm in his possession, but shavings and sawdust of that wood, which had apparently escaped his notice, were found behind a leg of his work beach

When the case came to trial, one of the star witnesses was Arthur Koehler, who testified that these scraps had been identified at the Forest Products Laboratory and that they had been proved to be of the tellfale whate eim. Members of the jury declared, after they had found Magnuson guilty of marder in the first degree, that the combined testimony of koekler and of experts in metallography sent from the University of Wisconsin to help identify other parts of the bomb, played a leading part in convincing them of Magnuson's guilt.

lanocence as well as guilt has been



A braided whip from the Incebark tree, one of the odd specimens identified at the Laboratory

### Secrets Hidden in Wood

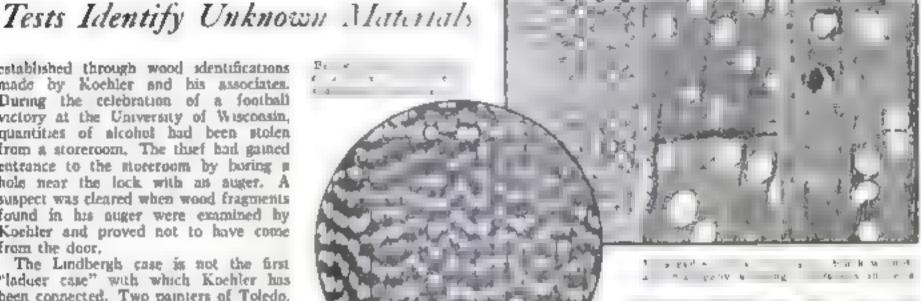
established through wood identifications made by Koehler and his associates. During the celebration of a football victory at the University of Wisconsin, quantities of alcohol had been stolen from a storeroom. The thief had gained entrance to the storeroom by boring a hole near the lock with an auger. A suspect was cleared when wood fragments

found in his auger were emmined by Koehler and proved not to have come from the door,

The Lindbergh case is not the first "ladger case" with which Kochler has been connected. Two painters of Toledo, Ohio, were injured by the failure of a ladder rung which was supposed to support a ladder jack and one end of a scaffold. The injured men brought suit for domages against the company which had made the ladder. Kochler conducted a demonstration in court, explaining the characteristics of brash and sound material, and showing the possibility of injury to strength of rungs through rough handling. After listening to his testimony, the court decided that the ladder company had not been at fault.

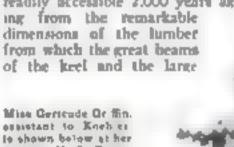
THERE is remance and adventure con-nected with the work of wood identification. Not long ago the services of the Laboratory were sought by a solvage company which was trying to gain access to a ship sunk 134 years ago off the coast of Delaware. In diving operations two ships had been discovered in close proxlmity to each other, and in order to save the expense and danger of entering both ships, the divers took specimens of wood from each ship. These were sent to the Forest Products Laboratory, and the designation of one specimen as Jumaica dogwood and the other as a species of juniper helped the salvagers determine. by a search of marine records, which was the supposed treasure ships

The mystery which still conceals some of the post can be partly lifted by means of wood identification. When Italian



engineers, at Premier Massoum's insigntion, drained a part of Lake Nemi and uncovered the gasey that nearly 2 000 years ago had been a floating pulace of pleasure for the Ruman Emperor, I the one of the brit things that was the plen natation of the wood amous parts of the ship.

The predominant wood of Aceppo page ewing to its high resin content was in a perfect state of preservation, despite having been immersed in water for hundreds of years. Even today in the hills and low mountains of Umbria, Pieus halepenus is a profuse variety. It is probable that this was the timber most readily accessible 2,000 years ago. Judg-



desk in U & Forent



Photom crographs of red oak and white oak, bedringen ton 31 deveniers or bran about

boards of the belting were cut, we can believe that very beautiful forests must have existed there at that time

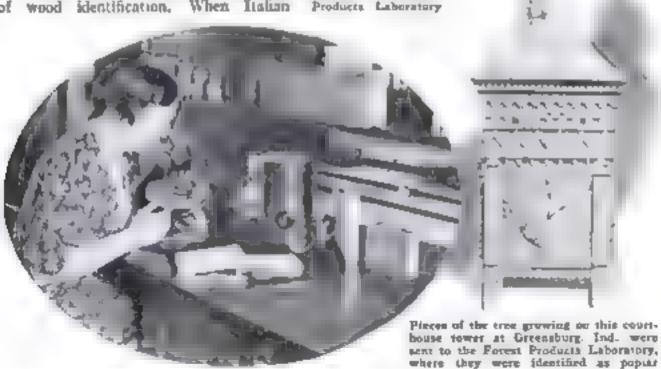
in order to determine the history of a treeless prairie valley in the southern part of Florida, wood specimens were submitted to the Forest Products Laboratory for identification. In ditching operations in the Kasimee Valley a number of tree stumps had been unearthed.

indicating that at one time these prairies were forested. Two of the specimens were of yellow pine, while another had the characteristics of wax myrtle, of which two species grow in the South at the present time.

A stump found where an Alaskan glacier had receded was examined by Miss Gertrude Griffin, microscopist in Koehler's section on wood identification, and found to be spruce. Muss Gramm has noted, in her varied experience in identifying wood, that many encient or fossilized spectmens coming from widely separated parts of the world, are spruce

Kochier, speaking of the requests for identification of oid woods, makes his own interesting comment.

"Sometimes we receive partly decayed wood, such as that from old (Communed on page 114)



### ODD AIRCRAFT AIDS TRAFFIC STUDY



When police of Paris, France, recently undertook to study traffic conditions, they hovered over the city in the hybrid aircraft shown in the picture above. The lifting part of the machine is a non-rigid army observation blimp. This has been turned into a

dirigible by adding a modified airplane which contains a motor and controls, and has skids instead of landing wheels. The wings are pivoted and, when they are inclined, the craft is able to climb or descend at the will of the operators.

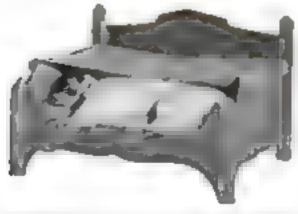


### ELECTRIC SOLES KEEP MOTORIST'S FEET WARM

ELECTRICALLY heated soies, which may be worn inside any pair of shoes, are a recent German invention to end the discomfoct of chilly feet during a winter drive. Electric current from the car's battery is provided through a plug-and-socket connection on the instrument panel, from which cables lead to the pads. When the driver wishes to leave his car, he can detach the cables from the soles.

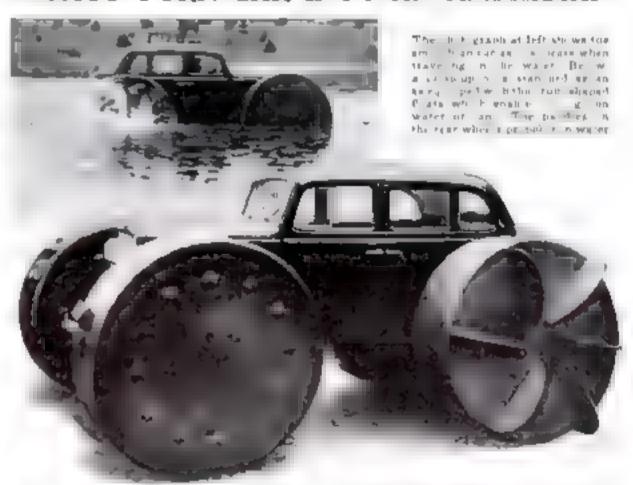
#### YEAR-ROUND DOG COUCH

A non-lover may provide all-the-year-round sleeping comfort for his pet, with the introduction of a combination couch that must appear luxurious to canine eyes. Built like a bed in miniature it offers a warm mattress for a winter-day nap, to-gether with an overhanging canopy as a shield from drafts. In summer this canopy serves as a hammock where the dog may lie to keep cool, as shown above



Combination dog couch, as it is used in wister

### FLOATS TURN CAR INTO AN AMPHIBIAN



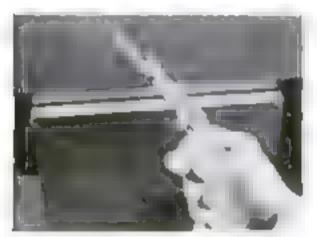
By REMOVING the wheels of a standard sedan and substituting buoyant, drumshaped pontoons, a German inventor has rendered the machine capable of traveling with equal case on hand or water. Tests show that the amphibian car rides sufficiently high, when affoat, to prevent even a drop of water from entering the body or eagine compartment. Six paddles on each

of the rear drams, which are rotated by the power of the car's motor propel the car in the water On land, it rides on the flat rims, resembling a road roller in miniature. Smaller floats than the ones used on this experimental machine are being perfected by the inventor for use by tourists and campers, and will be readily interchangeable with conventional pneumatic wheels.

### Horizontal Telescope Scans the Stars



been the mirror is correctly ad puned, an electric motor automatically luring it at a pace that just compensates for the rotation of the earth, keeping the telescope trained on any particular start. While the telescope is in use a pair of folding doors in the roof of the haiding housing the mirror are kept open to a real pair of the mirror are kept open.



#### MAKES SAW FILING EASY

Dutt saws are sharpened accurately and with a minimum of fatigue by the new saw filer shown above, whose pistol grip, bolding a standard triangular file, is shaped especially to fit the hand. By keeping an adjustable guide rod parallel with the saw blade, all the teeth may be filed alike and at the proper angle—straight across for ripsaws, and at various angles for cross-cut saws.

### ELECTRIC ENGINES GO STREAMLINE

FIFTY-SEVEN streamlined locomotives recently ordered by the Pennsylvania Rattroad for its projected high-speed passenger service between New York and Washington, D. C., will be the most powerful ever

The new inscrume is the late -- '

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private observato in the world which

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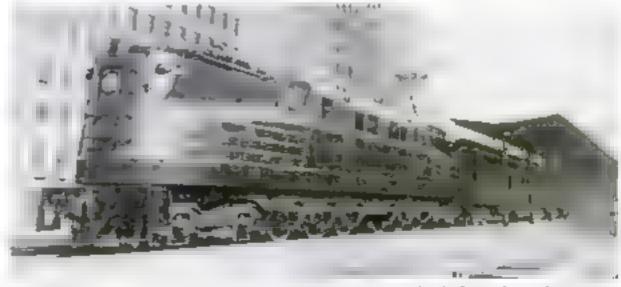
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to boul passenger trains. The 4620-horsepower engines will be capable of a regular operating speed of ninety miles an hour Their design places the motorman's cab near the center, with unobstructed view



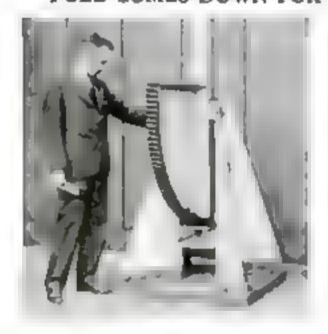
Streamlined electric locomotive of the type to be put in service by the Pennsylvania Railroad

#### MIDGET CAR RUNS ON TWO WHEELS



THOUGH it has four wheels, a modget car exhibited in England runs on only two. The tiny machine is balanced like a motorcycle, but is guided by a steering wheel instead of handlebars. Two small auxiliary wheels keep the car upright in turning or stopping. The narrow body, equipped with a windshield, seats two persons

#### POLE COMES DOWN FOR PAINTING



WHEN a flag pole of recent invention needs painting, no steeplejack need climb it. A crank. operating a worm gear at its base, lowers the pole to a horisontal position. to which a better and speeder job of painting may be done. The photograph shows the invention applied to a forty-two-foot steel flag pole, in the vertical position.

# The anusual driving where are up writer as the constant of the

#### NOVEL GEAR DRIVES BICYCLE

AN ECCENTRIC, star-shaped disk serves as both hub and spokes of a novel driving wheel for breycles, devised by a Long Beach, Calif., inventor. The five-sided disk transmits power to the rim through four rollers upon which it is free to turn in either direction, the weight of the rider locking the inner and outer wheels.



#### HAMS EXPLORE ULTRA-SHORT WAVES

To excuse the little-known region of ultra-short waves, with practical television as their goal, radio amateurs have set up a five-meter station in New York City with its special telescopic beam antenna, shown above, atop a hotel roof. Using only fifteen watts of power, the station has established two-way voice communication with nearly every town within forty miles. The tests prove that such transmission is possible over considerable distances.



### FOUNTAIN BRUSH FOR STENCILING

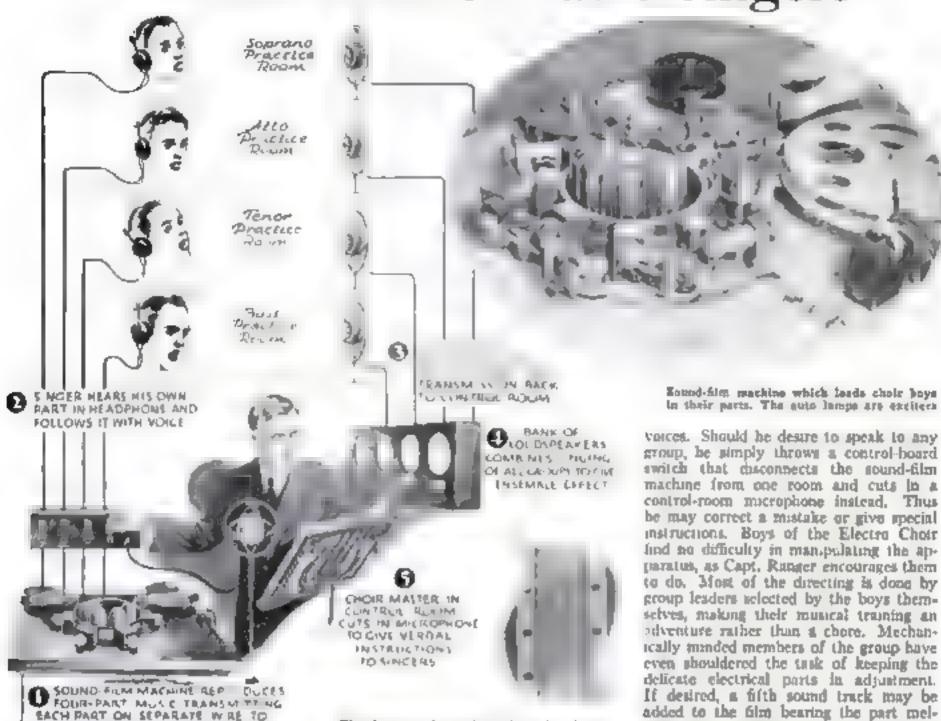
Hanny for stenciling, a new fountain brush contains a generous supply of ink in its handle. Even flow of ink to the bristics in assured by pressing occasionally upon a button that operates a disphragm pump, as shown in the illustration. This forces the disphragm inward and keeps sufficient ink in the bristies for continuous stenciling.

### ESKIMO BOY IS SHIP MODEL FAN

Even within the shadow of the Arctic Circle, model makers are to be found. The photograph at the right shows an Eskimo boy of the Ungava district of northern Canada trying out his miniature sailboat, with a flour bag serving as a sail. The model is a faithful reproduction of the nomiak, a large type of Eakimo craft with wooden frame and bull of scalskins, which accommodates ten or more persons. In favorable wind a square sail is used, otherwise the craft are propelled by broad paddles.



### Electric Robot Trains Singers



strip of the sound film used in the machine

The disgram above shows how the electric

choir master works. At right, above, is a

dividual headphones. A microphone in the practice room picks up their singing and carries it back to one of a bank of loudspeakers in the control room. Here the leader of the choir listens to the blended

group, he simply throws a control-hoard switch that disconnects the sound-film machine from one room and cuts in a control-room microphone instead. Thus be may correct a mistake or give special instructions. Boys of the Electra Chost find no difficulty in manipulating the apparatus, as Capt. Ranger encourages them to do. Most of the directing is done by group leaders selected by the boys themselves, making their munical training an adventure rather than 4 chore. Mechanically minded members of the group have even shouldered the task of keeping the delicate electrical parts in adjustment. If desired, a fifth sound track may be added to the film bearing the part melodsen, thus additional track bearing the musical accompaniment with which the boys will eventually sing in public. This sound record is used for the final rehearsals of the united groups, after they

have perfected their own parts separately

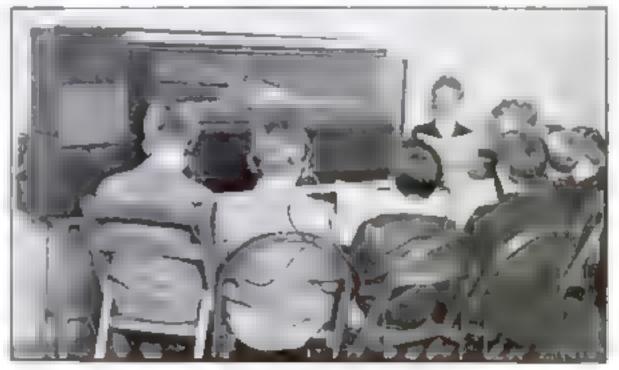
Certain refinements have been made in

the system as the result of suggestions

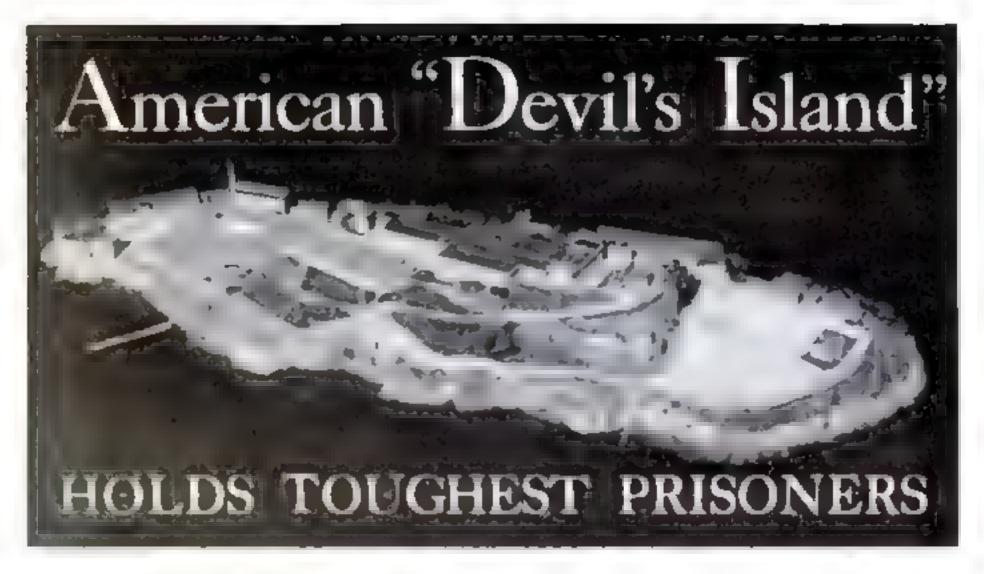
from the boys themselves.

N ELECTRIC singing master that quickly teaches boys to blend their voices has been perfected by Capt. Richard H. Ranger, of Newark, N. J., as the latest of his in-ventions in the field of electrical music Hatherto the instructor of a glee club or choir has had to train the bass, tenor, alto and soprano groups one at a time, later bringing them all together. The new apparatus, however, enables all the singers to practice at once. It has already been used successfully to train a group of sixty that calls itself the "Electro Choir." How it works is shown in the accompanying diagram. The heart of the apporatus is a sound-film machine especially designed to lead the singers in their parts, which is set up in a "control room" of the clubhouse where the singers practice. The machine resembles the reproducers used in sound movies, with one important difference. Music recorded on the film is split up into four separate sound tracks corresponding to the four singing groups' parts. Each part is picked up by a separate photo-electric cell and transmitted electrically to one of four separate practice rooms in the cabhouse, where the singers of that particular group bear their part through a loudspeaker or through in-

CORRESPONDING PRACTICE ROOM



A group of boys in our of the practice rooms, singing with the sid of headphones. The loudspeaker beside the piano provides an alternate means of bringing maste or instructions



OOL steel that no file can scratch, locks that can be opened electrically and mechanically only by two men from widely separated posts forty veteran guards hand-picked from other federal prisons, armed with automatic pistols, rides, and machine guast tear gas, electric instruments that reveal the presence of hinden par ols or knives on the persons of prisoners or visitors burbed-wire entanglements, one and one half miles of water whose current defies all but the strongest swimmer, patrol boats of penitentiary and coast guard; pelson radio that can summon 200 police cars to the shores of San Francisco Bay in five in the strongest.

Thus, through science and skilled officers, does Uncle Sam guard 211 of the world's worst felons on twelve-acre Alcateas Island, a bleak rock in San Francisco Bay which for nearly a century has served as a prison. Recently the old cell block has been reconstructed internally, with the latest types of scientific devices ready to quell instantly any uprising or call upon law-enforcement agencies the length of the Pacific coast for aid should a prisoner escape. Today Alcateas is the most formulable rock-bound prison fortress the world has ever known, far more securely guarded than the famous French Devil's Island.

Uncle Sam holds little hope of reforming the crooks he has incarcerated there. He sent them to Alcatras for three reasons to make sure they will not intrude themselves among law-abiding citizens before they have paid their penalties to society, to save them from the possible wrath of their enemies, and to make it impossible for them to spread their evil industrie among less hardened criminals.

For some years the Department of Justice has practiced segregation of prisoners. Heretofore it has taken the form of separating younger prisoners and first-termers from two- and three-time losers, hoping thus to reform many of them. Now Uncle Sam has moved to the other end of the line and isolated the touchest. From now on the Department of Justice will strive to keep them by themselves in what is considered the world's first escape-proof prison.

"Segregation has bad a large port in federal programs in reforming offenders against society," Warden James A. Johnston told me, "Campa, farms—prisons by whatever name—with liberties within each institution serve to help rehabilitate less hardened convicts. At Alcatrax we reach the form of prison where maximum accurity with limited privileges is sought Generally, these men have had opportunities in other prisons to reclaim themselves; but now their records make it necessary for the government to lay emphasis on their security."

For that reason the Department of Justice hit upon the idea of reconstructing Alcatras and using it as a preson for these

On a Bleak Rock in San Francisco
Bay, Uncle Sam Hos Reared the
World's Most Formidable Prison

By ANDREW R. BOONE



A guard at Altatrax Island watches the movements of presoners from one of the four towers. Powerful floodlights, radio equipment, and speedy patrol bosts assist in preventing strapes and deliveries

desperate criminals. The island lends itself admirably to that plan. It is within reach of near-by cities, but is not readily accessible. It enables prison authorities to take advantage of natural surroundings.

Enaborate precautions have been taken to guarantee security. The tells are built of too proof sicel, with window guards of the same metal. Doors are locked automatically by temote levers. One door or an doors by units of fifteen may be opened attractionally. When prisoners march from one building to another two men are required to open each door. A gate keeper and an armorer, the former swinging a lever and the latter pushing a butten to close an electrical circuit so the key can be turned in the lock, must work together. They see each ather through a bullet-proof glass window and task with each other through a microphonic unit, yet it is impossible for prisoners to reach both of them at once and thus force these way from the cell block.

No weapon other than those comprising the carefully counted and double-checked arms of the guards, is permitted within the prison. All visitors, including state and federal officers, are searched by a hinden electrical detector as they enter the prison. At several points where prisoners or visitors must walk in single is a two detectors are in blen from view. Any gunders of even a nate in erforces with the electrical circuit in a detectors. Near-by a butter butter and a high forces of the guard that someone is cattying a weapon

take han asue for Annual Many prison I as Annual Many

room where prisoners are been prorate themselves with weapons in the form
of kn yes, forks, and spoons. Scattered
around the ce and of the Alcatras cafeteria are several brightly-polahed oval
disks, not unlike automatic water sprinkfert. His len behard their immiposing enteriors, however, are outlets for tear gas.
Although guards mingle with the prisoners
without fire-arms, a single turn of a wheel
by a guard standing behind butlet-proof
glass will flood the droing room with gas
and leave the prisoners gasping for breath

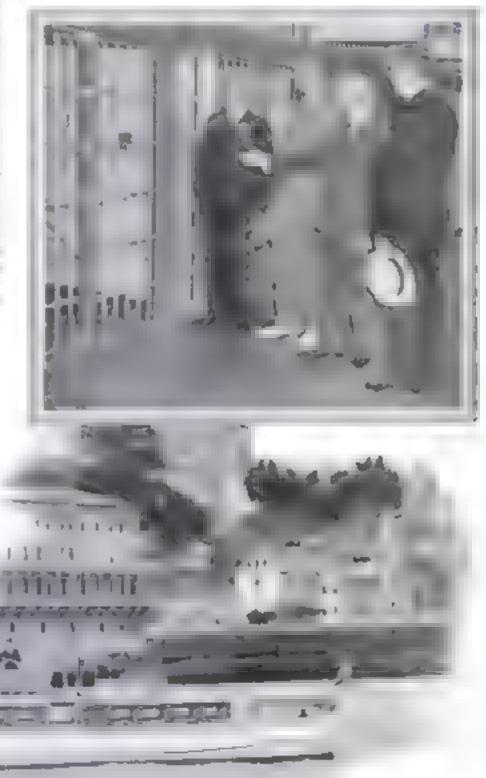
The personers are marched from cellblocks to the d mag room in small groups in entering each is given a ke ie and fork. At the close of the meal he checks in his utensils.

Although they are accorded few privileges, the prisoners are fed wed, Here is a typical day's menu

Breakfast—outment and milk, fried hologia sausage, cottage fried polators toast pleomargarine, and conce

Dinner—bean soup, roast beef and gravy stringless beans, mashed potatoes bread, pleomargarine, and coffe Supper—pork and beans, com bread, potato salad, apricots, bread, oreomarganne, and coffee

Department of Justice officials, in planning the new Alcatraz have at empted to outguess every move gangland might make. Any attempt to hierate a prisoner presumably would involve a boat if or that reason no craft regardless of size or ownership, is permitted within 200 varies of the rocky shores. No visitor is permitted unless he presents a pass signed by the A orney General of the United States. No prisoner may see a visitor during his first four months. (Intimate on page 100)





Four guard towers like the one shown above, each reached from the prison wall by a high catwalk, enable guards to overlook all parts of the mand

### World's

### RESTS ON SUNKEN

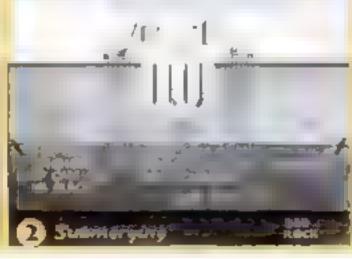
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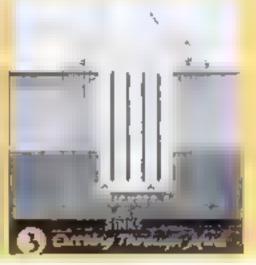
the new-type causon, sunk for the beg to be to the way of the betew feel of the bottom. These has lew
eet were of steel to form a cut may eage
that word stice through the mad on the

A a affort the casson looked like a feethwes. The hives were steel domes welded to the tops of fifty in a feether with the casson for any second in the west than the casson thus made buoyant in the west than the casson in the west than the case of the ca









### LARGEST BRIDGE

### SKYSCRAPERS

the casson and at fi-leg cranes set upon the tembers. A plant fender was then built ground the casson to protect it from chance codesion with boats or dears.

Through jointed metal pipes, called "elephant trunks" by the workmen, concrete was poured around the tubes until the increased weight of the causon almost submerged if Workmen with a cetylene torches then cut the gomes from the tops of the tubes, removing only a few at a time so as not to disturb the alisson's buoyancy, Twenty-foot lengths were then added to cach take and the domes welded to the tops of the new lengths. At the same time, the limber a les of the case son were built up. More concrete was poured in, offsetting the buoyancy of the added tube sections. Thus the carsson was suck antil it settled in the mad about eighty feet be aw be surfa-

When the casson, new a mass of concrete honeycombed by the fifty-five tubes, was bronly embedded in the mud, his pressure in the tubes was granually released core being taken that the structure remained perfectly plants. The domes were then cut off and the tubes became sharts for the excavating back its

Lowered by cranes, these clam-shell back ers pranged down the tubes and grabbed up four curic yards of mud at a time ralong it and dropping it into the adjacent bay. When harder bottom was encountered, high-pressure water hose was dropped into the Tubes. The jets of water cut and softened the clay so that it could be grabbed easily by the ackets. At the mist and clay were expected, the cutsion set led deeper and that he



force to rest on rock 150 feet lown. The he toms of the turns at this time were seared with

height filled with wa or I mer was ready for the a stone of the above-wa er shalf of concre-

The pier is one of fifty-one but well support the mammo horage. Forty-four will be below water and one will rest on bed rock 218 feet below the surface. This unprecedented number of piers is required not

only by the great length of the bridge but by the

The double suspension bridge, which will cross the two miles of west channel, is the only one of its kind ever built. It will have two decks, the bigher one accommodating three truck lanes and

the budge, will have (Continued on page 111)

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be ween he as a Ye a. Buyna and San Flag a big



### By JOHN E. LODGE

ECAUSE you can't hear yourself talk, a new business is booming. Radio riars, like everyone else, hear the gound vibrations within their heads rather than the actual tones that reach the listeners. To hear themselves as others do and thus to improve their programs, nearly all top-notchers in recent months have been having their programs recorded on phonograph disks, so that they may play them over and study them critically later on. Eddie

Cantor, Joe Cook, Burns and Allen Faul Whiteman, Lawrence Tibbett and Rudy Vallee are but a few of the noted names of radio that listen in on their own broadcasts by this method.

In three eastern lanoratories alone last year, tiny cutters of steel plawed more than 10,000 miles of grooves in spinning disks of wax, metal, and composition material to record in permanent form programs picked from the air

At least a dozen studies now are in full swing. The oldest laboratory than in any previous year. Advertising agencies, hiring talent for the air, now select it almost exclusively from recon-Politicians, lawyers, tourists, dramatists and business bureous as well as rad stars, are taking advantage of the servic-They add to the list of strange requests and queer demands that keep the recor makers busy

Not long ago, for example, an Eastern football team ordered records of all the broadcasts made during one of its ow games. That night, members of the squad listened to the comments of the arnouncers, bearing what millions of fans had heard during the game a few bours before.

In another case, a music publisher with branch offices throughout the country introduced a new song On the night of its first broadcast, he had records made to send to all the branch managers to show how the music should be played and how the words should be sang. Over the week end, the studio turned out 100 duplicate records and had them ready for distribution on Monday

Speed is an important ttem in the reproducing work. Many stars demand that the records he rushed to them as soon as the broadcast is over. Some send messengers to get them; others come to the recording laboratories to

hear them, still others want them played

over the telephone.

Lawrence Tibbett always has his records hurried to the broadcasteng studio so be can take them home with him and play them before going to bed. He has a complete library of his broadcasts. Walter Winchell, the gossip columnist, has everything he says on the nir recorded. But he doesn't do this just to hear the sound of his own voice. He keeps the records as evidence of what he really said in case

he is misquoted or even sued for libel. Burns and Allen want their records de-

byered at their apartment after every appearance on the air. They play them over and over to study the timing of their gags and to be sure they are nut rushing their jokes too fast for the lis-

tenem to get them.

TO DEVELOP

One hurry-up call the recording engineers are sure to get is from stars that broadcast twice on the same night. Frequently, a hig hook-up goes on the air for Eastern and Central states at \$ 30 P M. Eastern Time, and then is repeated for Rucky Mountain and west coast states at 11.30 P.M. Every time Gladys Swarthout, Frank Chapman, and other stars appear on such a schedule they have the records sent to them immediately after the first broadcast so they can go over them to improve the second performance.

If you visited one of these recording studios, you would see huge deskirke machines with whirling turntables and a battery of dials. The programs are taken from the air by regular receiving sets, ampliced, and recorded by the special apparatus. As many as six machines may be in action at the same time and the recording can be switched from one turntable to the other so no part of a program M lost.

About the time of the stock market crash, in 1979, commercial recording began. It came in with the depression and consequently got away for a slaw start. Home outfits, placed upon the market for private use, bad only a mild success. The alumnum record, which had been



### Hear Themselves

NEW TRICKS

evolved by Victor H Emerson New York inventor after innumerable experiments with various metals, made rapid recording possible. In the first days of the commercial studios, these disks were employed almost universally. The difficulty is that they can be used only with thorn, cartus or casein needles. Steel needles, which give a maximum of volume and brillance,

are too hard.

Wax, or pressed, records, which take the steel needles and are the kind used for regular phonograph recording, give the finest results. But they are out of the question for quick delivery. To make each record requires half a dozen steps, including an electrolytic bath and a baking at high temperatures. It is from five to ten days before the record can be delivered and the cost of recording a fifteenminute program runs to almost \$100.

A couple of years ago, a record with a metal base and an acetale-composition covering appeared on the market. Four aprayings of the composition went on the metal and there was a delay of several days before the acetate was thoroughly dried. However, the records, which could be played with steel needles, were ready for delivery as soon as the cutting was done-

In the constant search for better and quicker methods, the engineers have worked out a number of impovations



After the grooves are out in the record, they are placed in this special heating chamber and baked for two hours. to harden them. This is done only with soft auriance secords. Others are ready for delivery as soon at they are out.



lately. One disk, imported from Germany, is said to give practically as good results as pressed records to has a soft upper sucface on a hard acetate composition have. The new disks come from Germany packed like stacks of pancakes within special metal containers. They are baked for leaving the cutting room and then are ready for delivery

Another innovation along the same line is a dask just announced by George W DanJunas, an American radio pioneer. Also of an acetate composition, it is nonbreakable, can be made in thirty seconds, and is ready for delivery the instant it is taken from the recording machine. It is said to be the product of more than five years of research and upwards al 20,000 experiments.

During the last election, radio recording was called into play by a number of politicians. One candidate ordered all of his opponent's speeches sent to him for study Emphasis and inflection, not shown in stenographic reports of a speech, often play an important part in giving a twist to a sentence. For this reason, one lawmaker has suggested that all political speeches be recorded and placed on file

In a bot local campaign in the East, two party orators broadcast speeches from big stations and had records made. More than thirty duplicates were run off and sent to smaller stations in the vicinny. During the last bours of the campage, the air was plastered with their appeal to the voters.

Recording laboratories, however, are none too enthusiastic about taking the work of candidates. This fact dates to an experience several years ago. An optimistic politician ordered records of everything he said on the radio. He made innumerable speeches and then, when he was defeated, the war chest of his party was found insufficient to pay the bill.

When duplicate comes of a record are made, the first record is "rebroadcast in the laboratory and other disks grooved by the recording machines. Usually, a filteen-minute program fills two twelveinch records. Sometimes, larger sixteeninch records will hold the whole program. both faces of the disk being cut.

Almost every day, I was told, people come to the studies and have records made to send to friends or relatives



This picture shows the process of recording a radio program on aluminum results by means of a new apparatus purfected a few weeks ago. The work can be go tched from one tab's to the other

abroad. The standard rate for such 'talking letters" runs from \$1.50 to \$2.50, according to their length.

Lawyers are also using the recording service to supplement written confessions and testimony which they latend to introduce in court. Sometimes, witnesses maintain they did not know what they were signing in the written statements taken down by stenographers. With the records giving their testimony in their own voices, such retractions are made difficult

In still another way, radio recording is figuring in legal action,

Recently, the Better Business Bureau of an Eastern city was on the trail of a group of gyp clothiers. When the dealers advertised on the air, offering sensational values far in excess of the real worth of the clothing, the Bureau had records made of the broadcasts. This evidence, and the threat of legal action, drove the shady merchants from the air.

In one New York laboratory, I was shown the beginnings of a curious library of recorded voices of the great. Whenever noted men or women make speeches over the radio, their voices are added to the collection. Political conventions and large gatherings increase the growing last of records. Besides Its historical value. the collection has a present practical one. In programs, for instance, in which actors imitate the voices and speaking mannerisms of personalities in the news spothight they rely upon the records for help.

Some months ago, a manufacturer put on a series of interviews with noted persons. Before the programs started, be made arrangements to have them recorded and after every broadcast presented a record of the interview to the distinguished guest as a souvenir of the occasion.

Similarly, orchestra leaders, like Paul Whiteman and Rudy Vallee, send records to radio stars who appear as guest artists on their programs. Values was one of the original users of radio recording. He started the practice of engaging new talent almost exclusively through records. New songs are sent to him on disks so he can

relect the ones best suited to his voice. Other singing stars of the radio are also receiving new numbers as records instead of as sheet music. It enables them to play the lunes over and over at home and learn them with a minimum of effort,

An improvement in recording, to be introduced within a few months, is a twin-track record designed to give "three dimensional" sound. Twin microphones, in different parts of the room, will pick up the sounds of an original broadcast Recorded on the parallel grooves of the disk, the sounds will be reproduced simultaneously. The effect, according to the inventor, will be to give mechanical recording two cars instead of one-to give sound three dimensions but as stereopticon pictures give a sensation of depth as well as length and breadth.

Improved methods and an increase in the volume of business have cut the costs of radio recording until a fifteen-minute program is now listed at from \$5.00 to \$7.50, according to the kind of record used. Aluminum is the cheapent. The original cost was a dollar a minute. While the aluminum records require a radio-phonograph hook-un to get satisfactory volume, the acetate disks can be played on an ordinary phonograph.

As you watch one of these black disks being turned into a record, you see a tiny glistening thread stream from the cutting point as it plows its sparal groove in the surface. More than 1,000 feet of this thread is formed in cutting one side of a twelve-inch record and some 3,200 feet of grooving is required to bold a complete fifteen-minute program.

One of the buggest orders ever received by a recording laboratory came, not long ago, from a peanut distributing organization in the south. The company had put an elaborate and expensive program on the air in a chain book-up. Then it had records made of the broadcast and sent duplicates to practically every independent radio station in the country. These stations used the records for fill-in programs. To see how the different announceers handled the material, the company ordered records made of many of the rebroadcasts which would not reach its home office in the south,

Other buyers of radio time are adopting the same plan. In order to get full benefit from an especially fine program, they are baving it recorded and are sending duplicate disks to smaller stations for

spot broadcasting.

On several occasions, manufacturers have sponsored programs which did not reach their part of the country after they had become interested in the feature through recordings. The Voice of Experience, for example, was sold to a midwestern (Continue d on page 112)



To improve the harmony between herself and her occhestra, Gladya Swarthout has records made of her broadcast songs

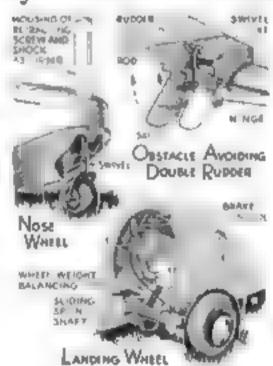


## Three-Wheeled Amphibian

ANDING on dry ground, a dangerous operation for most amphibian planes, is made safer by the unusual construction of a new craft of this type designed and built by Captain Frank T. Courtney, noted airplane designer. The use of an auxiliary swiveled landing wheel at the nose of the plane makes it possible to place the main wheels well back, preventing ground-looping without the usual risk of nosing over. Other construction details give this plane a speed and maneuverability not commonly found in amphibians.

To make the plane land on earth exactly as on water, the main landing wheels were put on at the main step of the hull, which in the part that touches first in a water landing. With these wheels attached so far back, the plane would, of course tip forward on its nose as the speed slackened, so a retractable swiveling nose wheel was installed. This nose wheel absolutely cures the common tendency of amphibians to nose over when brakes are applied. Having the main landing wheels so far behind the center of gravity also prevents skidding ground-loops, which most amphibians hasten to perform if one wheel strikes an obstacle, with consequent terrific wrench-

### By STEWART ROUSE



Details of the none wheel, chatacle-avoiding radder, and mela land up wheels of the plane

ing and injury of the airplane's structure.

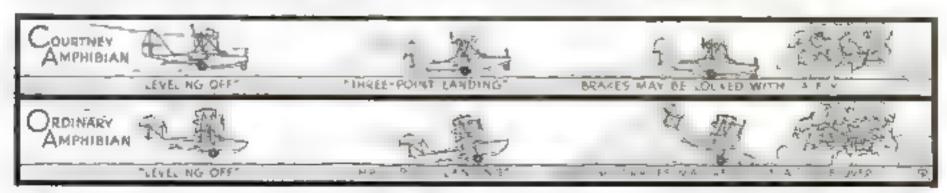
In the water the plane handles nicely, having a double water rudder which is hanged to move upward on straking an

obstacle. It is connected so that it steers in conjunction with the air rul ler from one set of controls

Retraction of the main landing wheels into the bull is complete, and the nose wheel is only slightly exposed when retracted. Each main wheel is mounted on a heavy crank attached to a sliding splined shaft, rooted in a large collar. To retract the wheels, each splined shaft is rotated until its wheel-supporting crank is vertical. Then a giant turnbuckle draws the shafts inside the bull, pulling the wheels into their spaces. Retraction of the nose wheel is accomplished by a screw jack.

Streamine design gives this plane a speed of 151 mutes per hour. It is claimed that the design of the motor nacelle which houses the 365 horsepower engine and its thirty-one-inch drive shaft, conserves about forty-five horsepower usually wasted. The oil tank forms the front rim of the low-drag engine cowl.

The five possengers carried by the airplane enter the cabin by opening the right half of the windshield. A fore hatch and an after hatch give access to huge luggage compartments. The entire airplane is of metal, excepting the wings, which are of conventional wooden construction with metal fittings.



The drawlegs above show how the Courtney emphibian differs from the ordinary land-and-water plans in fauding on dry ground. The men fending wheels are properly placed to permit the plans to land gracefully, and the noise wheel prevents noting over

FEBRUARY 1935

### COASTING

with a

## Parachute

IS WORLD'S MOST TERRILLING SPORT





HITCHING a sled to a parachute, a dare-devil Frenchman has devised the most thrilling sport in the world. Down snow-covered slopes so precipatous that any other way of attempting them would be fony, be coasts at breath-taking speed, the 'chute billowing behind him and providing his only security against disaster

The inventor of this exhilarating pastime is Hubert Garrigue, government meteorologist at an observatory in the French Pyrences. For years he has been fascinated by the study

of the tempestuous winds that sweep up the sides of the peak on which the observatory stands, and he has made elaborate observations of them by releasing minusture paper parachutes to be carned aloft by the air currents. One day the idea occurred to him of riding the wind himself.

He built a sled with sky-shaped runners,



An experimental paper parachete hovering above the observatory built on a peak in the Pyrenees for a study of prevailing winds

tilted slightly outward from each other to give stability and avoid pitching the daring rider from his large, woven saddle. To this contrivance, Garrigue attached a large, self-opening parachute with an area of more than ten square yards. At first gingerly and then with increased confidence,

ring out his strange appara ha on the mounta bane. He learned at digitide walls case we slopes of territying stee, s, pi ched at a stant of fore)

It is a thruling experience. Loose snow, borne on the rising winds, stings the rider's face and all but blands him as he plummets downward at express-train velocity One moment a gust checks his plunge, and, the next, an air pocket drops him with a sensation akin to that experienced in a falling elevator. By leaning to one side or the other, the rider steers his vehicle, abeering away from bare rocks that would rip his parachute to shreds and send him burtling to destruction. Here is the timehonored sport of coasting raised to a new peak of audacity!

Nor is Garrigue content, like must coasting enthusiasts, to plod patiently back for the next thrilling descent. His next experiment, he says, will be an attempt to make the wind carry him uphil.

Intrusting himself to the mercy of gusts of extreme violence, sweeping upward through narrow, confined passages in the face of the mountain, he believes that his parachute will haul him up slopes as steep as fifty-five degrees and back to the starting point

# The Man Sur Market with the Net

IN SEAWATER, gold is for times as plentiful as silver

HAILSTONES in South Africa recently killed a tertaine big enough to support a man on its back.

JAPANESE sharks lay the biggest regs of any living creature. They are twice as big as estrick eggs.



THROUGHOUT the world, twins come once in a hundred births. In Ireland, they come once in sepandy-two births,

YOU CAN look two ways at once in a new whirling microscope which is being used by accountate to compare different groups of bacteria.

ELECTRIC fish can governor annual cur-



THE AVERAGE boy grows eight makes between fourteen and sixteen,

A HORNED tood ins't a tond; a schworm leu't a worm, a gloss souke con't a reake; a white art isn't an ant. A horned tond is a leard a tilkworm is a caterpillar a gloss snake is a leard and a white ant is a termite, belonging to another famity of insects.

SNA LS have replaced men in cleaning mass from citrus trees on the island of Jamaico.



WHEAT that grasskappers man't est is being planted in North Dabota. Developed at an agricultural experiment station near Furga it is known as Ceres wheat. Why the inserts would it is unknown.

FLOWERS run temperatures. French resentists have found that when the non-turtium, dandelion and sweet pen are budding, they develop temperatures saveral degrees above that of the surrounding air.



### VACCINE FOR INFANTILE PARALYSIS

A NEW vaccine against infantile paralysis, developed in the research laboratories of the New York City Health Department, received its first public use the other day when twentyfive children were moculated. Physicians boped the event marked the turning point in the long right to check the dreaded discase in the way diphtherm and other chudhood diseases have been conquered. Tests conducted by Dr Wolfiam H. Park, director of the laboratories, and his assistants, showed that children can be made immune to infantile paralysis but the duration of immunits is not known. The new vaccine is prepared from the spanal cord of a monkey that has the disease

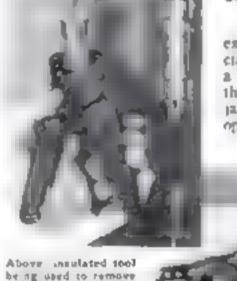


One of first children treated is moculated with new severe

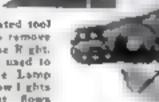
### SHOCKPROOF TOOL TESTS WIRES

Testina electric outlets to see if they are "live," extracting blown fuses, and tracing trouble in open circuits, are among the varied tasks performed by a versatile electrical tool just introduced. Because the device is built of shockproof materials, its pher jaws provide a safe means of pulling a fuse. At the opposite end of the implement are a pair of prongs

that may be inserted in an electric outlet or held across a pair of wires under test. A miniature lamp, built into the tool, lights if there is current on the line. As only one hand is used, it is a most impossible to receive a shock while using the device thus.



Above insulated tool being used to remove human ourland Right, prings being used to lest recented a Lomp shown by a row I ghts when gurrent flows

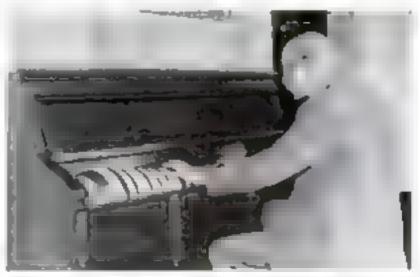


### FRANKLIN'S GLASS ORGAN STILL USED

Oxes popular among musicians the glassbarmonika, which emits its tones from revolving glass bowls, is today one of the rarest of musical instruments. Only three specimens are reported in existence in the world

-the one shown here which is in the possession of Bernhard Fritzsch, of Cincinnat), Ohio and the others abroad. The instrument's forty-two glass bowls, of gradunted sizes, are mounted on a common axis and revolved by a foot treadle. To play an air, the performer applies his mosstened fingertips to the rotating bowls, which are arranged chromatscally. The instrument was the invention of

Benjamin Franklin. The story goes that while employing a primitive device for generating static electricity, consisting of a revolving sulphur globe subbed with the hands, he discovered the principle on which the glassharmonika operates.



Playing rate fattrament by touching bowl with damp fingertips

### DOGS GET NEW SERUM FOR DISTEMPER



IMMUNIZING a dog against distemper, one of the deadnest of canine diseases, for the rest of its life is reported to be made possible with a single injection of a new serum preparation. Developed by Dr George Watson Little, New York canine specialist, the treatment consists of administering simultaneously a dose of the living virus of the disease and a concentrated serum obtained from dogs which have had distemper. Veterinarians who have tested the preparation report that

dogs thus inoculated, by means of a hypodermic needle, may apparently be exposed to the disease immediately of at any future time without contracting it. The treatment also serves as a preventive one for dogs already exposed, the tests indicate. Immuniang treatments for distemper have hitherto required repeated injections instead of a single one, and have not conferred immediate protection. The treatment is a simple one and is said to cause little pain or inconvenience to the subject.



#### LIFE BELT HAS LIGHT

To sectionate the rescue of survivors of a maritime disaster occurring at night, a life belt with a built-in electric lamp has been invested by a young engineer of Boston, Mass. The illuminated beacons wou diguide rescue craft to persons struggling in the water. Current for the amplia famished by an ingenious, self-acting battery comprising a pair of dissimilar metals, and operating only when immersed in water. Thus it remains mactive until the wearer of the belt plunges into the sea, when the tamp automatically lights, Similar automatic beacons may be installed in life-boats, the inventor suggests.



#### CURRENT HEATS LADLE

Heaten by electricity, a new ladle for use in home workshops or small commercial shops provides a handy means of melting such materials as paraffin, solder, insulating compounds, pitch, and low-melting-point alloys. It may also be used to draw off molten material from a larger container and keep it hot until it is ready to be poured, as shown in the photograph above. An electric besting element in the hase makes temperatures up to 600 degrees F. available, current being supplied from any convenient outset by means of a cord. Various sizes of the new ladles are available ranging up to eight pints.

### WHEN AN EXPLOSIVES TRUCK EXPLODES

Witest brightly painted trucks labeled "Explosives" roll along the public highways, most car drivers give them a wide berth and wonder what would happen if one should blow up. Photographs reproduced here taken after a truck carrying quirts of introdyceon exploited prodict the answer. The machine was traveling along a dirt road in the Texas parhandle region when, for some unexplained teason its contents were defonated. The truck and its driver were blown to bit ind a hole twenty feet wide and six feet is was torn in the high-packed toal.

Fragments of the motor, like the one illustrated, were the largest pieces found intact Debris was scattered for half a mile around, and the blast was beard fifteen inter away.



Above a tag or a degree of the gest places of the

The emplosion of the truck load of a ro
g a b c

won v oc w de n a hard-packed dere road accurate dear a



### All Shipshape

BERTON BRALEY

Y husband is really a model

(A ship-model husband, I'd say)

For there is a twist in his noddle.

That makes him pecuniar that way.

He planes and he starts and he whittles,

Gets covered with varnish and glue.

And hardly sits down to his victuals.

When he's got a model in view.

Brigantines, barkentines, schooners and yachts.
These are the toys that he plans and he plans.
Dingheys and whaleboats
And motor and sail boats
Filling up all the available spotal
Models in living room, bedroom and bath
Fashioned in beauty, says be,
Still, I assert with some natural wrath,
Dusting 'em's up to ME!

He steak from my work-box, he trides
With pieces of silk and of net.
Swipes thread for his rigging, and rifes
The tools of my manicure set.
You cannot sit up to a table
You cannot sit down in a their
But what there's a sper
Or a mucilage far
Or a keel or a rudder post there!

Oalleons and caravels, clippers and scows
Barges with dragons and things on their hous,
Galleys and pross
And arks like old Nosh's
—Pretty to look at, but—pity a spouse!
Pity a housewife who's hemmed all about
Cluttered with craft of the sea,
Models of ships are a treasure, no doubt,
Fun to exhibit, a joy to work out,
Nevertheless I am longing to shout
"Dusting 'em's up to ME!"

### SMOTHER FIRES WITH ASBESTOS

Ast Askestos blanket, introduced in England as a new motor accessory, quickly smothers a fire without damage to the car's engine. When folded up, the blanket makes a small parcel that is carried near the driver's seat, within reach in case of an emergency. If a fire starts, it is a second's work to open the blanket and toss it on the flames.



Using an aspector blanket to amother a fire

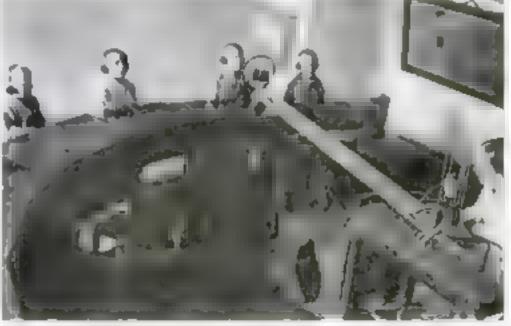
### MACHINE CORRECTS GOLF SWING



Guaring povices guickly learn to swing a club in the proper are, it is said, with the aid of an improved practice device introduced in a Chicago school. The student stands within a spiral metal rule that guides his club throughout the stroke, from address to followthrough. By letting the club side lightly along the guide, the tyro learns the feet of a swing made with perfect form, and soon acquires sufficient skill to dispense with this arti-ficial aid. The photograph at the left shows the device in use. After a little practice with the device, it is said, correct use of the club becomes habitual

### MIKE REVEALS SPEECH DEFECTS

To an school children to overcome defects in speech and hearing special classes have open instrated in a Russian laboratory equipped with innevations in modern electrical sound apparatus. One of these is a microphone on a swinging boom supported by a wheel at the end. By means of a handle within arm's reach, the instructor may roll the microphone along a senucircular row of desks and place it before each one of the pupils in turn. His speech, amplified and heard through a loud-speaker, may be compared with that of his fellow students and thus corrected. Each pupil is also provided with earphones for use in hearing exercises, designed for improving the hearing of children deficient in this sense.

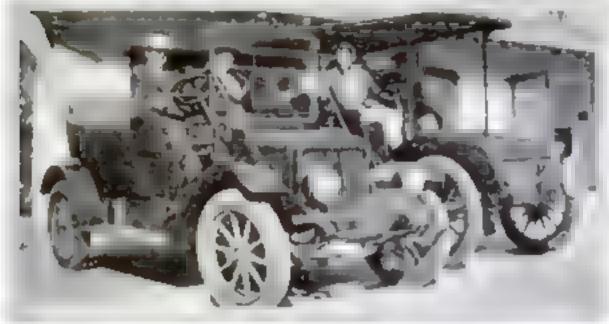


Microphone on traveling boom used to correcting speech defects of Russian children

### Fleet of Antique Cars Is

How a Ca Grown in Commerci

This 1903 Places Arrow Stanhope model plainty shows its descent from the once popular Stanhops horse-drawn phaston, now nearly forgotten Rumble-seat passengers perched on the front



Above, a reminder of the days when motorists were divided over the relative merin of gas and steam. Harry E. Twohy a 1911 model White Steamer is shown alongside a 1901-model, two-cy inder Packerd, The photograph was taken at a movie studio.

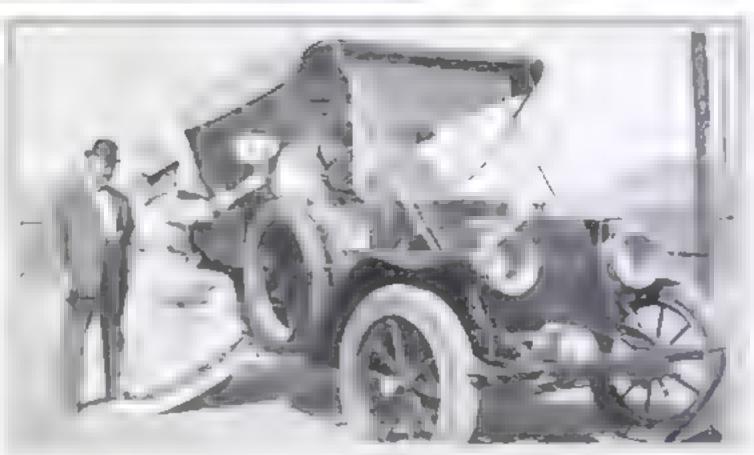
A Caditine touring car vintage of 1909, an it appeared at a Los Angalas auto abow with the persengers and driver clad in the motoring costumes of the period. Note the acceptance wide lames, and apringstant agmechanism.

How a Californian's Odd Hobby Has Grown into a Traveling Museum of Commercial and Historical Value

HEN a movie producer wants a tar of ancient vintage, or an automobile maker wishes to exhibit a model of long ago, the chances are that Harry E. Twohy, of Los Angeles, Calif., can fill their needs. Just as others collect old toms or furniture, he collects old automobiles. Today he owns what is probably the world's largest fleet of antique cars in running order. A surprisingly profitable business has developed from the collection that he started as a hobby, some years ago, with the purchase of a 1902 Pierce Arrow

Wherever Twohy drove this acquisition, crowds gathered. A merchant, seeing the display value of the reac, paid Twohy to pace advertisements on it. Other offers followed. The car went to an auto show as an exhibit. Then a movie company bired it, to put atmosphere into a film depicting the days when automobiles were "borseless carriages."

Twohy began buying obsolete cars, repainting and reconditioning them, and sending them chugging forth to advertise bis enterprise. When his machines found increasing demand for auto shows, parades, motion pictures, and advertising purposes, he offered cash rewards for information as to where care twenty years or more old could be found, Some he came upon, dismuntled, in cellury and garrets. One venerable car turned up in a barn on an isolated farm, in the state of Washington, twelve miles from the nearest road. Tharty years before, a farmer had bought the machine and dragged it with horses up a stream bed to his farm, to await the coming of a highway that







One of Twohy's rare specimens—a 1906 Buick touring car—as it appeared in a scene of a recent motion picture abowing college life a quarter century ago. The driver's continue is also of the period

cars that really belonged in his collection, because tires could not be secured for putting them on the road. Lest fire or accident wipe out the fleet. Twoby keeps his machines scattered in private garages. With the passing of time they will be-

users. A modern motorist would be at a loss to han he these old timers, which is clutches that push in lostart the car moving; and gearshift and brake levers outside the driver's teat. Equally strange to the present-day driver are their drip-feed many systems single-take

Upkeep and storage for the growing collection present serious problems. Spare parts no longer are available from the makers and must be made to order in a machine shop. Tires can no longer be obtained for some models. In some cases he has been forced to reject

tires, and dry-cell ignition.

scattered in private garages. With the passing of time they will become increasingly valuable and irreplaceable—a veritable museum in wheels, and a profitable one

FEBRUARY, 1935

### DIVER NOW SHOOTS FISH UNDER WATER



equipment is light enough in weight to

avoid hindering his movements, permetting

him to bring his weapon into quick action

at the sight of his game. The apparatus

is intended to be used at relatively shall

low depths, and sufficient air is carried (or

a stay of twenty-five minutes beneath the

surface. In the accompanying illustration, our artist depicts a diver employing

this novel means of fishing. The inventor

says that, with his new apparatus in good

working condition, the sport is perfectly

safe and should prove popular with those fiving pear the sea or on the banks of

SHOOTING fish with darts, from a point of vantage beneath the waves, is envisioned by a French inventor who has just constructed a remarkable diving ke for the purpose. A light belief and a cylinder of compressed air enable the diver to breathe under water, while another tube leads from the tank to one of the strangest weapons over devised. This invention.

SPECIAL PUMP SERVES

### SPECIAL PUMP SERVES OIL TO MOTOR CARS

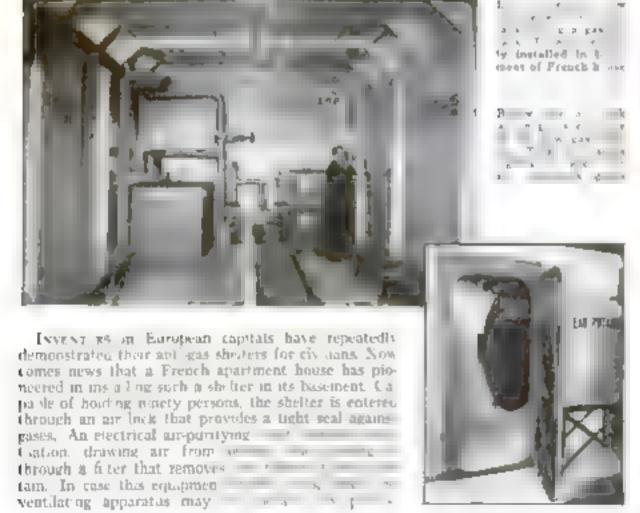
Moron oil is vended after the manner of gasoline by a pump especially designed for the purpose, recently exhibited to automobile men. This dispenser is replenished with oil in scaled, ten-ga lon containers knobs on the face of the machine are adjusted to be quantity and grade of oil desired which is oel vered through a flexible bose to the ear's graph case.

#### MAKES VIOLET PERFUME

Arten years of research, a way has been found to manufacture irone, the substance responsible for the scent of violets. The discoverer of the synthetic method of manufacturer is Dr. Albert Verley, a French scientist who has long specialised in perfumes.

### GASPROOF SHELTER PUT IN BASEMENT

large lakes

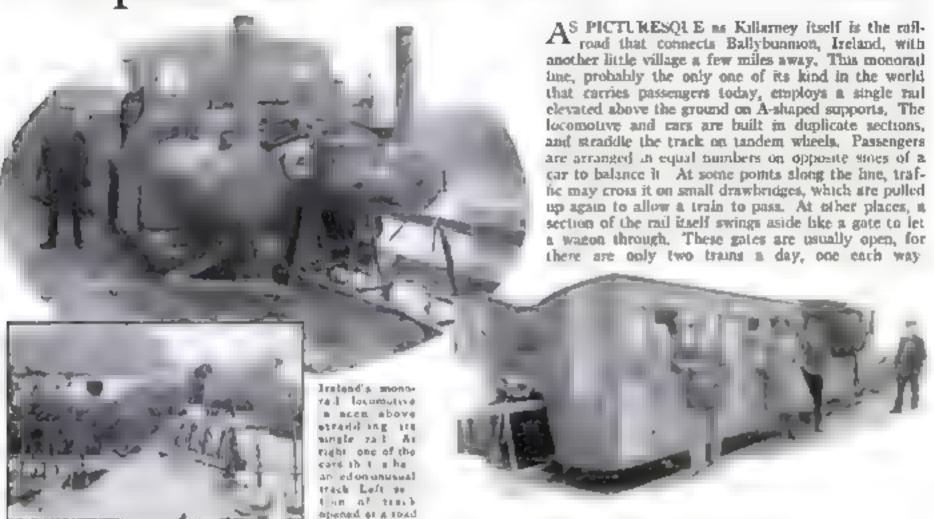




### PARCELS WRAPPED FAST WITH NEW-TYPE PAPER

A commentation wrapping paper, with which fragile articles may be wrapped for mading in a single operation, has just been placed on the market. Formerly two wrappings were required, one with still board and one with paper. The new material has an inner liming of tough, cushioning material, while the exterior is a plain paper surface, firmly attached to it. The combination material (olds ground corners and over sharp edges with the ease of ordinary wrapping paper. It is supplied in sheets and rolls of various sizes,

# Unique Irish Trains Run on One Rail

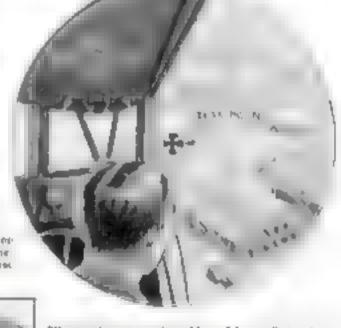


#### NEW AIRPLANE WINDOW KEEPS RAIN OUT EVEN WHEN OPEN

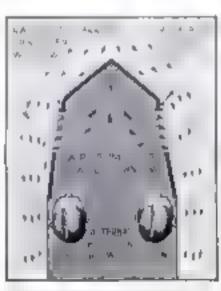
A WINDOW that can be kept wide open without admitting a drop of rain or a flake of snow has just been perfected for airplanes. By that feat, engineers of the National Advisory Committee for Aeronautics enable a pilot to enjoy unobstructed forward vision retarriess of the weather, removing one of the greatest of present baxards to aviators. Tests at Langley Field, Va., led to the development of the new window. The "N A.C.A Kain Vision Windshead" of which it is a part, comprises three panes of conventional type and two of the new windows one being placed at each side of the tapered country to the when the regu-

the for use when the regular windows are observed By including his head teninches in eather direction the pilot may obtain a clear view past the nose of the plane and along the corresponding side. Rain is kept from cutering and blanding the pilot by a twofold expedient. The main wind stream, with the raindrops it bears is fed past the open window by skillful streamlining worked out in wind tunnel tests, of which an important part is the curved forward edge of the window and its protrading, attitude testing metal ledge. To aid in preventing the passing wind from entering his cockpit, the pilot can increase the air pressure in his cabin slightly by letting in air through a controllable folet, such as is used in many

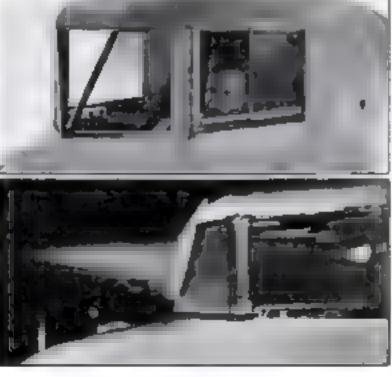
The two views below show a full-sized model of rain-vision windship 4 being dranched duling restical test to wind tinne to show its performance under combinions found in actual unc



Busination gives river idea of how pilot gets an undemmed view shead regard res of the weather



This diagram shows how shape of window deflects wind and keeps cain from entering the cochpit

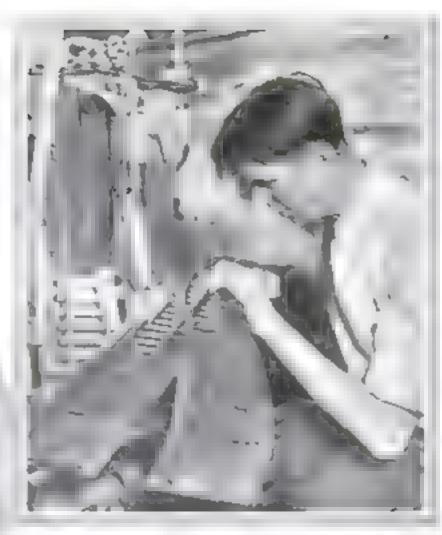


modern planes for ventilation, having its intake at the lower front of the fusclage. In consequence, there is set up a gentle air current blowing out of the window, as a further barrier to raindrops coming in. When a full-sized model of an airpeane fuse-age was set up in a wand tunnel and drenched with a spray of artificial rain, none entered the open window. The new window is expected to be a special boon to pilots in the critical moments of take-off and landing, when clear vision is of vital importance. It is said to be equally adaptable to the control cabins of nirstrps in which rain-clouded windshields are as much of a safety problem as m all other types of heavier-than-air

# Realistic Model Railway

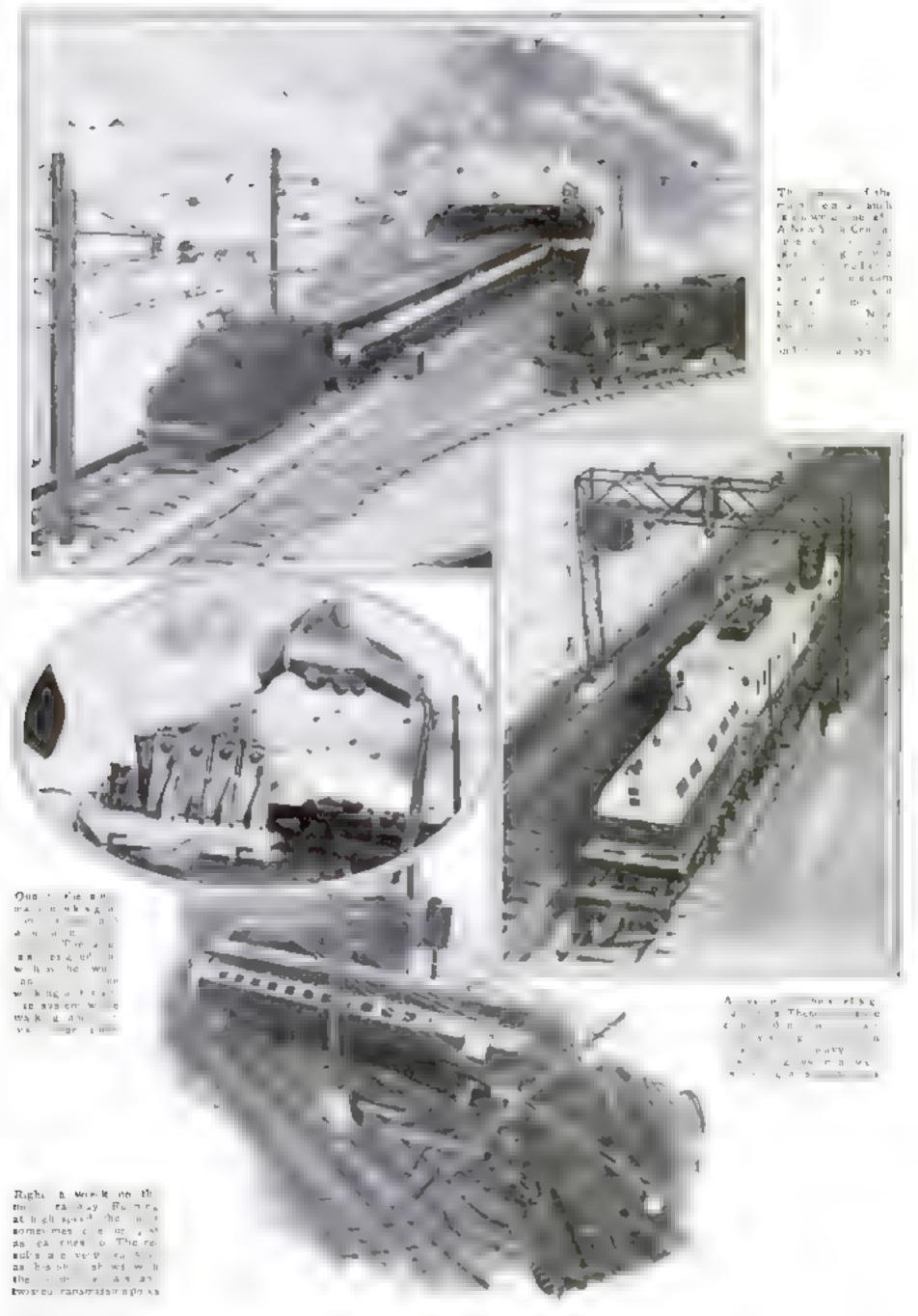
FILLS A BASEMENT





Encounce of he tunnel the g white he was a second to get agone. The insulators are reade of vest buttons that are joined tog-

SAILROAD line suspends operation when S. G. Lit. Sk. Cl. 190 Conn. tends his furnace. The system, which he on is the Spring Glen Lines, is one of the mosclaborate model ranways in the world. Seor he had not been a single of In while a branch rouge ries so go a he front of the bin. William of the sit. is fash langer at along the reroll automatically to a stop. The is a make of in a Contra four relays and eighty-three sep " . w being employed on one section of the Killing at 1 - h hest on 3 a00 hand made ties spaced along a gravel rondord numbering more than 700, ar ona. Scenery consente ed to a real stic betting for the tracks



# Plants that Feed Each Other

FOUND WITH YOUR MICROSCOPE





Above, a dead true limb, on which a fungus is growing. In this case, the fungue gate his own nourishment from the decaying wood

Laft rout hympic num of a toadtroot. Above, a plent peripership
pf alga gulla and fuagua atranda

at a magnification of at least 100 diameters.

You will see a tangled mass of white

or colorless threads among which are scattered pieces of bright green material. Closer examination reveals that these green bits have a definite structure. They may form threads or masses of round or clongsted cells, whose granules or disks of green chtorophy.) will be revealed by higher magnification. Here, then, is the answer to the ques-

Here, then, is the answer to the question of how the lichen can live. The green bodies are calls of an alga, while the colorless atrands are parts of a

fungus. The sign may be of the same type as that you have seen growing as a green mass on the surface of a pond, or creeping over the outside of a flower pot. The fungus is a relative of the mushrooms you had for dinner

A fungus, lacking green chiorophyll which would enable it to manufactore life-giving starch from sunlight and air and water, must absorb its food ready-made. That is why molds and toad-scools always are found growing on decaying wood or other materials from which they can absorb ready-made food. The fungus part of the lichen has to get its food accondhand, but instead of selecting a mast of decaying leaves for its home, it has persuaded the chlorophyll-containing algae to join with it in setting up a novel kind of plant partnership.

The alga-fungus organization has worked out a production schedule so satisfactory that no labor troubles ever arise, so long as moisture and light and air are available. The alga manufactures starch for itself and the fungus, from air, sunlight, and water. The fungus, which has to depend entirely on the alga for its meals, does its share of the work by providing protection to the alga and by absorbing moisture from the air

Speren produced by gill plate on a toudstool. The dark mass at the bottom of the print is the gill surface OLR microscope will reveal to you one of the wonders of the Plant Kingdom—a strange partnership in which two plants have pooled their resources, with apparent advantage to both

You are, no doubt, familiar in a general way with lichens, those formations that grow on the barks of trees, the sides of rocks, and fence rails. You may have noticed how frequently they are the first living things to appear on rocks in a quarry, on surfaces left exposed by the cutting away of stone. They flourish there, without soil and, to the casual observer, apparently without other means of obtaining food.

How can the lichen thrive on bare rock, where soil is lacking? The answer to this question can be revealed beautifully by your microscope. Go into the woods and find a gray-green lichen that is growing on a rock or tree trunk. Break it off and take it to your microscope laboratory. With scalpel or razor blade, cut sections from the piece. Lay some of these on a microscope slide, add a drop of water, and tear them into small particles with dissecting needles. Add a cover glass. Now look at the pieces through your microscope,

# A tiny residenced found in the field or a much-

room from the grocery sears, we a provide hours

of fascinating antertainment with a microscope

The lichen, therefore, is a portnership of green algae embedded in the grayish strands of a fungus plant. The brighter green of a wet lichen is caused by the fact that the protective layer of fungus strands is more nearly trans-parent when wet than when dry. The power of the fungus to absorb water from the surrounding air is emazing It can live in places too dry for any other vegetation. Even after being kept in a dry state for years, some lichens are said to become completely revived in a short time, if placed in water or a moist atmosphere.

For a better understanding of the lichen, you can make a microscopic exploration of fungl and algae. The fungl world is an extensive that no more than a few high spots can be considered here, and the aligne must, for the time being, be left out entirely. However, you will not want for microscope material, for even a single mushroom or toadstool will provide bours of fascinating entertainment.

The common mushroom, that you have seen growing in fields and woods and on rotting logs as a plant but it differs so much from the general idea of plants that it is of extraordinary interest. More accurate y speaking, the mushroom itself, the part of it with which the average person is familiar, is but a portion of a plant. It is the visible outcropping of a subterranean network, hidden in the soil or within the decaying mass.

This underground network, called the mycelium or spawn, is a system of cells whose function is to gather food from the medium in which it is growing. It grows usually in leaf-mold decaying wood, and such places because of the great amount of ready-made food to be found there. Under the microscope the mycelium looks somewhat like a root system, and is made up of colorless strands with hour the threads or branches.

The myce ium of the common mushroom lives entirely underground, just beneath the surface. Careful examination of almost any particle of rich soil or rotting leaves will reveal it. Simply place the particle in a test tube or bottle of water and shake it vigorously, to wash away foreign matter. The mycellum fibers can be separated in a mass with tweezers. Perhaps an easier method is to find a mushroom, dig it up with a spoon so that part of the soil beneath it is obtained, and then wash

### Strange Partnership of Fungi and Algae for Mutual Benefit

### By MORTON C. WALLING

the dirt away from the rootlike myceaum without bruising it The mycelium is a plant in itself, but because the local food supply may not last forever, it has to send out spores that will start new colonies of fungi in other localities. To do this, it produces frusing bodies. These are the mushrooms you know. They spring up overnight at various points in the mycelium network. The process involves a sort of gathering of mycenum strands into knots which grow and merge into the stem and cap

of a fruiting body that frequently is parasol-shaped.

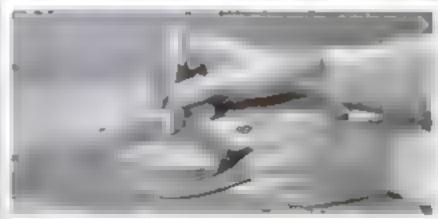
Examine a common mushroom. You will find that it has a stem surmounted by an umbrella-shaped cap. Around the stem is a ring of membranous tissue. Over the cap is a layer of similar tissue, which may extend as a ragged layer at the edges. The underside of the cap is lined with a system of gills which are plates that radiate like the spokes of a wheel. The ring

> around the stem was formed during the growth of the mushroom by the breaking of the protective membrane that was stretched over the entire structure when it burst through the ground.

You will find it interesting to examine the entire atructure of a musbroom with your microscope With a sharp knife, cut thin slices rum the sigm and cap, and mount them in water on slides. You can employ various microscopic stains to bring out the structures of the cells. You will, however, fail to find any of (Continued on page 93)







The occopusitive object in the center of the page is a formation of myceham strands a guichen. The photographs above abow auccessive steps in that us parafon cells for temporary sindes. A thin candle a morded in e piece of pipe which is removed by heating it gently and ofting the wick. The cell is spun by holding a bot candle end against the glass



Berg, of Akron, Ohio, can put them in their place, for his midget automobile, he claims, travels fifty-two miles on a gallon of gas. Built by an Akron engineer at a cost of only twenty dollars, the tiny two-scater machine is said to attain a speed of forty-five miles an hour, under the power of an old motor-cycle engine installed at the rear. A lock starter sets the engine running, and foot pidals in the driver's compartment provide a clutch, an accelerator, and a brake, while gears are shifted with a hand lever. Tires of doughout type are used



Jump in gircle above back starter of modest car.

#### BATS FEED ON FISH

A strance colony of bats, which exists only in the Gulf of Calsfornia, feeds upon fish. Recent examination of the bats' stomachs has disclosed remnanta of small fish. How the fish are caught has not yet been determined.



#### PAVE STREET WITH RUG TO TEST ITS ENDURANCE

Paving a city street with household floor covering was the unusual means chosen by a Tulsa, Okia., department score to advertise the wearing quality of its mer-chandise. For the odd demonstration, the maker supplied a piece of material 226 feet long and more feet wide, containing sufficient material to cover twenty kitchen floors, and said to be the largest rug ever manufactured in the United States. When laid on one of the main business streets, it extended for a substantial part of two city blocks. Cars rolled over it for two wreks. giving it more usage than such a rug would be likely to receive in many years



So plantess may harvest sugar cane at the moment it reaches perfect ripeness, a German optical maker has developed an amazing new instrument called a refractometer that measures ripeness with absolute accuracy. The instrument resembles a small telescope except for the wedgelike end, which contains a prism covered by a hunged lid. Cane juice to be tested is dropped on the lid, which is then closed When the device is held to the light and focused, the tester sees a circular field marked by a scale. Light passing through the sample of juice in refracted in proportion to the sugar and other solids contamed in the fluid, darketing a corresponding portion of the field.



#### POCKET METER TO TEST LIGHT IN YOUR HOME

Wirst the aid of a new pocket illumination meter, anyone may determine for hamself whether the light from electric lamps in his home or office in sufficient for his needs. All the user need do is to draw out a slide, uncovering a disk of pale yellow, light-sensitive paper in a circular window, and expose it for two and a half minutes at the spot where he sits or works. At the end of this time, if the sensitized paper has darkened to a deeper tint than the buff color of the envelope itself, the illumination is rated as good; while if the disk appears the aghter of the two, the light is bad. Additional tests are made by withdrawing the slide farther each time and exposing the ten disks of paper in turn.



New meter which showeripenessofaugar cano in Been in USE above. The result is read in a shadow that fa. a go a d al. At left BUZET CARD ERUZO BOD samp ing instruments. The hand is holding gauge for tomators

#### STAMPS PORTRAY THE NEXT WAR

Honnous of the next war are graphically depicted in a set of postage stamps just issued by the Soviet government, which are beheved the first of their kind ever printed. While announced simply as marking the twentieth anniversary of the World War, their appearance has aroused speculation as to whether they may constitute propaganda delaberately directed at militarism in other lands. The five-kopeck stamp. for example, portrays a akyline to be found nowhere but in the United States. It shows bombe

raining down upon a defenceless metropolis from air raiders button in the clouds pictorially expressing the view of many military experts that non-combatants as well as fighting forces will be marked for slaughter in future conflicts. The ten-kopeck stamp pictures the flight of the civil population to the open country, away from the charnel houses of the cities. Others in the set show an allegorical figure of a modern war god destroying a city; soldiers in



The stamp at the left depicts an air raid on a city, while the one at the right shows refugees flering

fine physical condition, march og to the front contrasted with returning cripples, and the lina, revolt of the opposed armies in mutual protest against the destruction of their famines, as symbolized by a pair of former enemies grasping hands and trampling underfoot a mulitary figure



#### ODD WHISTLE TESTS BROADCAST HOOKUP

A cuntous device known as a Galton whistle, which can emit a peep inaudible to human ears, helps maintain the quality of redio programs broadcast by a New York station. By turning a knurled knob at the top of the device, its pitch may gradually be raised until it passes beyond the range of audibility. Using this device as shown in the photo, a radio engineer can determine whether any given type of microphone or circuit is milficiently responsive to extremely high-nitched tones to meet the needs of brondcasting-



The Galton whistle in use for testing a crystal microphops of recent design



This notomatic device starts the engine of a parked automobile whenever the temperature gets law, and kneps it reaning long soungs to worse up for mice

#### MOTOR CYCLE CANNOT FALL OVER

Even when it is tipped to the angle shown in the pholograph above, a safety motor cycle recently demonstrated in Vienna, Austria, does not fall over. A spill in cuther direction is prevented by a pair of wheels mounted on either side of the regular rear wheel, and set so that they come into play when the machine tilts.

#### THIS KEY WON'T BE FORGOTTEN

A FACTORY superintendent at Columbus, Ohio, has invented a car key that reminds its owner to take it along. When the ignation is turned off, a spring on the shank of the key ejects it into the owner's hand

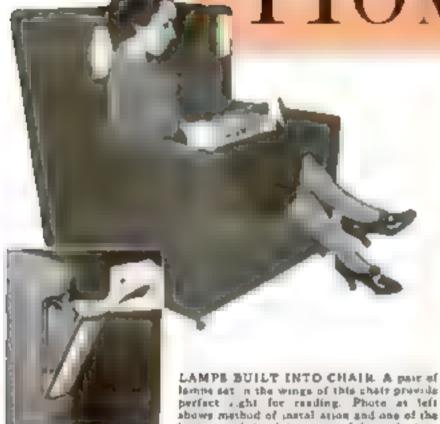


#### ROBOT RUNS ENGINE TO WARM IT

No matter how cold the weather, a parked car equipped with a new accessory is always ready for instant starting. To keep the machine warm, this rount automatically starts the motor whenever the radiator temperature falls below 120 degrees, shutting the motor off again when it has warmed up. The equipment includes a thermostatic control box that is installed under the bood, a switch on the instrument board to disconnect the robot when its operation is not desired, and a safety cut-out switch that prevents the device from operating if the car is inadvertently left in gear. There is also an automatic cut-out that prevents running down the battery if the motor fails to start for lack of fuel or any other reason.

### NEW IDEAS OF INTEREST TO

# HOMEMAKERS





REFLECTORS FOR SHAVING. A pair of reflectors placed on a ther side of the backtoom mirror as above at the loft, catch ight from the tamp overbead and reflect it to the aides of the face and under the chin. The same arrangement may be used on a lady a dressing take a Rriow, one of the ad untable reflector upits



MOSTENSHARD WATER This filtering day so, which can be arteched to any fauces by adjusting the chain in seid to soften any back water run brough or to say be used indefinency if the filtering material is regesserated

NIPPLE SCREWS ON Brinking of norting bottom in arts ching applies over the cape. It is iminated by the acrew-on hipp of thousand briow it can be put on in the dark and fingers need not touch the number surface. Anuther advantage is that it won to putl off, an ordinary alpoint do



bu be art behind its page of freeted glass









The artist c mouser above contains a small electric bolb that lights up susomes on ly when the brocker in bised, alluminating the keybole





CLINKER TONGS. The disagreeable task of removing but clinkers from the furnece is simplified by the long-handled tongs shown above. The trigger clamps the Jawa securely



PAPER HOLDS COFFEE GROUNDS. With this paper liner in the perfecting coffee basket of a percent of the grounds can be damped our enaity without the usual mass. The paper also serves to fitter the soffee, making it closers.



NEW STYLE COOKY CUTTER The automatic hands on the neval cooky current at self measures the dough, forms it, and cum it off. The device operates like a pump, forcing the soft dough through the perforated molding data at the lower end. The cutter course at apart for cleaning



HANDY RACK The versatile rack pictured above can be a speed on the back of a chair for drying towels no light clothing It may a so be used at a t.e or towel rack, or lastened to a shelf to support garment bangers



CORNER SHIELDS
AID IN CLEANING
Star-shaped little
ab side of opengy
mere shown at laft.
Areass, variated coto corners on staircases and a sewhere
Presenting a round
ad au face they do
away with corners
and make cleaning
sany Lower picture
abows size of abuild

ICE-CURE TONGS A. de nip way to herve ice cubes is provided by the tiny tongs shows be on Press on the thamb plunger opens (he spring jawn to pich up a cobe or drap it gently into the giasa



the photograph reproduced at the right

BEAN SLICER. The handy little kn Is below to used for sixting string booms or opening pea or ima bean puds. It stamps firm y to a table or bread board Biring beans at ead with I take loss time to sook, and the attings are out up



FOT KEEPS COPPEE WARM. Double watts in the new coffee pot at the right provide insulation witch hereps the contents warm until served. Any bot beverage will retain askes in this pot for two or three brone according to the manufacturers.



# CHEMICAL STUNTS with



to twenty parts of aluminum. Although not absolutely necessary, fifteen parts of potassium bichromate, which has been melted and allowed to cool, also can be added if it is handy When this addition is made, however, five parts more of the

alummum powder also should be included,

When thoroughly mixed, the thermit charge should be dumped into the crucible and a small depression made in the top to take a half-and-half musture of potassium perchlorate and aluminum or a small pile of magnesium powder. These chemicals serve merely as a priming mixture to start the process and do not enter into the reaction.

To conserve the heat, the crucible should be insulated. One effective method is to embed it in powdered fluorapar. Another, and perhaps simpler way, is to rest it in the open end

of a short length of ordinary pipe insulation

Finally, ignite the starting mixture of magnesium or potassum perchlorate and aluminum. This will immediately rated the temperature and soon the contents of the crucible walbe a glowing mass. Because of the vivid white flame given off as the aluminum steals the oxygen from the chromic oxide to give free chromium, the reaction should be watched only

when the eyes are protected with col-

ored goggles,

With a small fire pot of about fifty cubic centimeters capacity, the process should continue vigorously for fully a minute. When it cools, the chramium set free by the aluminum, and melted by the extremely high temperature, will be embedded as a lump in the arh at the bottom of the crucible. If a porcelain crucible was used, it usualty will reack of six own accord and simplify the problem of reclaiming the chromium. If a sand crucible bus been used, it can be stattered with a hammer

Although the metal obtained will not he absolutely pure, small pieces broken from the lump will be unmutakably metallic. Dropped into dilute nuric acid they will dissolve. Once placed in strong natric acid, however, they exhibit a pecubar passive effect in that they then will be insoluble in the weak acid until the passive surface is broken either by rubbing of sera ching

this of chromium also will produce a novel effect when dropped anto a shallow container of molten potassium nitrate or potassium chlorate. Like the

metal sodium on water it will float and

METALLIC CHROMIUM

How the home chemlot con prepare me sallte chromsom in thown in he illustrac ble in use must be well insulated as a temperature up to 1. 000 degrees becars during the experiment

Raymond B. Wailes

XEW metals are more spectacular chemically than chromium and manganese. Miniature lava-spit ting volcanoes, mysterious courchanging chemicals, and midget war-time smoke bombs are just a few of the possibilities they offer the home experi-

Even the production of the free met als provides a thrilling effect. A temperature ranging between 2,000 and 3,-000 degrees Centigrade must be used to break them away from their compounds In the home laboratory as well as commercially this is obtained with the aid of oxygen-loving aluminum in the spectacular thermit process.

In our experiments with from (P. S. M, Aug. '33, p. 50), we used the thermit process to free from from from axide In the present experiments we will use a thermit mixture to free chromium from chromic unde and manganese from manganese dioxide.

All that is required for the home manufacture of metallic chromium are a sand or porcelain crucible firing pot, some form of insulating material to prevent heat losses, a small quantity of automouth powder, potassium perchlorate or magnesium powder, and some chromic oxide (green) to serve as the source of chromium. The chemicals should be mixed in the proportions of fifty parts by weight of chromic oxide



A tiny volcant, produced in the home aboratory is shown a the circle At right, the manner of arranging and firing the volcano to give 1 felike eraption is shown



# Chromium and Manganese

skid around the surface of the mester mass with curious scintil ations. The trate or chlorate can be heated in the of a tin can held over the flame of sea.

laboratory gas burner

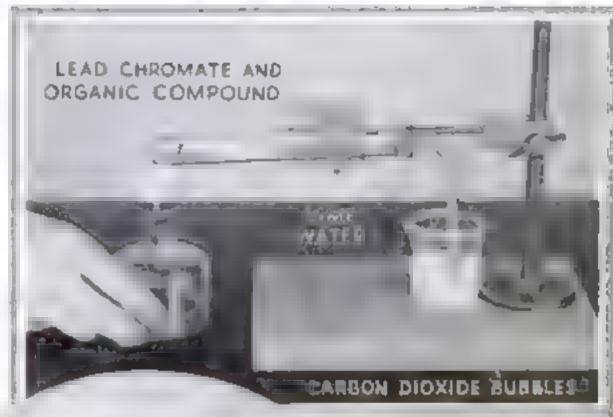
Metallic manganese can be made by the same method used to prepare the chromain, In this case, however, man, danied, which has been heated recomized with the aluminum powder of the chromic oxide. The potastioners of the manganese dies one parts of the manganese dies one part of aluminum powder, place it in the crucible, prepare the ignition mixture and touch it off.

In the various oxides of chromam, the amoteur chemist will find many interesting substances. One in particular, chromism trioxide, taken the form of woodly red crystals. To make a small quantity simply add strong (concentrated) sulphur ic acid to a strong water solution of patassium bichromate. Although the red

crystals which form cannot be filtered off with ordinary filter paper they can be removed from the solution with a filter made by packing glass wool into an ordinary glass funnel Before removing the crystals from the glass wool, wash them thoroughly with strong ni ric acid to remove the suppheric acid.

When brought in contact with such organic substances as absolute alcohol (alcohol which does not contain the usual four to six percent of water), these red chromium trioxide crystals immediately oxidize it, causing it to burn with a flush of firme. Even coal will be oxidized by the

crystals. Powdered coal, placed in a test tube and treated with a solution of potassium bickromate dissolved in fairly strong sulphoric acid effervences to give off quantities of car-





White and an expension of the poconstant for the polynomial of the new constant of the polynomial of

A C 15 15 House of B the area of the state o

bon dioxade gas. In both of these experiments, the large amount of everyon available in the phromium closide is responsible for the re-

her red chrom an compound decomposes actively with a history noise to give large quantities of

green ash, it forms the basis of a particularly novel home-laboratory experiment. With it the home chemist can produce a

miniature active volcano.

To enhance the effect, a tiny volcane mountain can be fashloved from a small amount of plaster of Paris. At the top, a
small bole formed in the plaster should then be filled with small
particles of ammonium bichromate and the chemical ignited
with a match. Bright flashes of light will dart from the opening as the volcano becomes "active" Steam will be formed and
a greet "lava" will bubble from the hole to run sluggishly down
the slope of the mountain.

Beside the realistic effect it produces, the experiment also has a practical value. The green material formed by the decomposition of the ammonium inchromate is the self-same chromic axide used in the preparation of free chromium.

Although it is best to use commercial ammonium bichromate in this experiment, if he desires, the home chemist can manufacture his own by neutralising ammonium hydroxide with the red, woody crystals of chromium trioxide (chromic acid), crystallizing it from the resulting solution.

Ammonium backromate also can be used as the basis of an interesting light-sensitive compound. Make a thin glue solution and dissolve in it some ammonium backromate (potassium backromate also will serve). Into this rub a pinch of lamp-black and brush the mixture onto a piece of cardboard as you would a coat of paint. Finally after the sample has been allowed to dry, place a camera negative or a cut out figure of some sort over the treated surface (Continued on page 107)

#### You Can Make Your Own Filter Paper

Since filter paper costs money and is sometimes hard to obtain, you can save time and cash by making your own as illustrated below. The necessary circles are cut of the required size from paper towels, which make good filters



#### INDOOR CLOCK STRIKES TOWER CHIMES



Cabinet for set of ama I chimes treemb as grandfather a grack

WITH an ingenous auxiliary timepiece developed by a New York sound-device man, a larger clock in a public building or outdoor advertising a splay can be made to strike the quarter hours without installing an expensive set of chimes. The small clock is operated by a set i starting synchronous elec-

tric motor and contains four tubular chimes. When the chimes are struck, a microphone picks up the sound. This is amplified by a unit in the base of the timepiece and trunsmatted by wire to a loud-speaker hidden in or near the large clock. The amphified sound is said to be as fine as that of a set of chimes costing thousands of dollars. Failure on account of current interruptions is prevented by an auxiliary spring in the striking mechanism. Although the auxiliary clock loses time while the current is off, the spring compensates for the loss and the chimes continue to sound at the proper intervals, regardless of how fast or how slow is the time shown by the clock



Bound of chimes for ourdoor clock is picked up by a microphene suppressed inside tribopiese



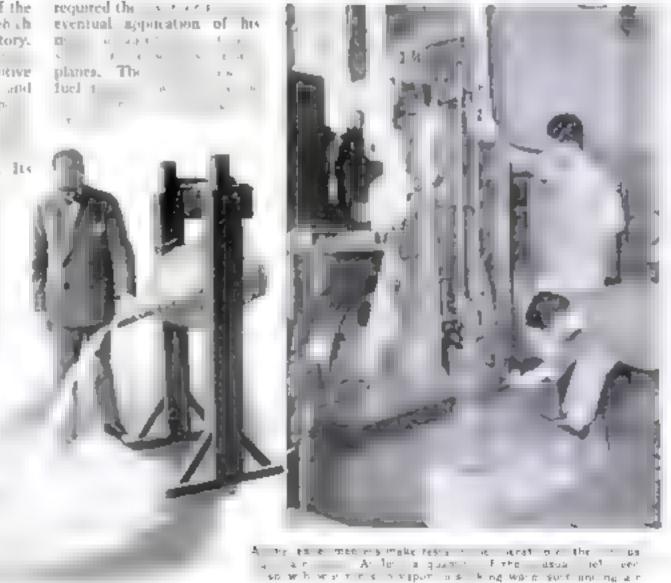
#### MUSIC BY ROBOT INSECTS

GROTESQUE manitums, patterned after insects and apparently endowed with musical divity are the creation of a Los Angeres, that it engineer Holden electric motors actuate the six-foot grass-bopper and the cricket shown in the libratration, making them appear to be playing upon the harp and violin. A concealed phonograph emits strains of music corresponding to the tones of real instruments and timed to match the movements of the odd figures. The photograph above shows the designer applying a faishing touch of color to one of the manukus before putting it through its paces.

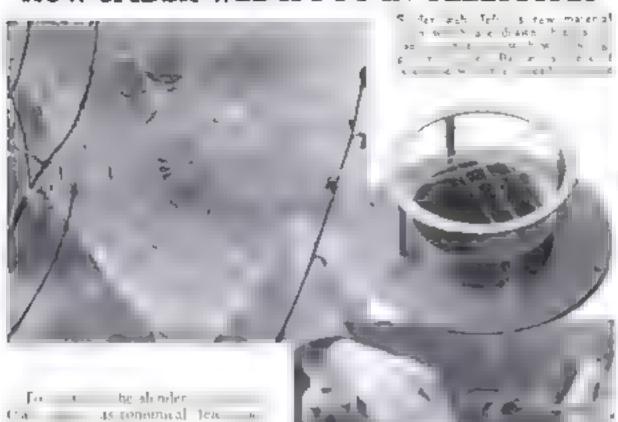
### LIQUID AIR USED AS FUEL BY REMARKABLE JAPANESE ENGINE

IQUID air serves as fuel for one of the strangest motors ever built, which now is operating in a Japanese absoratory. Should it fulfil the hopes of \$\var{v} \cdot \varphi\_0\$ It may bring about a revolution in motive power for vehicles of the land, sea and air. In contrast with the flery lemptures of a conventional internal-contion engine, which it somewhat reset the new motor operates at temperfrom 250 to 350 degrees below zero. Its small fuel tank be de ordinary a that has been chilled until it is traformed from a gas into a liquid like water. The difference in temperature between this extraordinary fuel and the surrounding atmosphere provides the energy to run the motor. From the fuel tank, the liquid air passes to a chamber where it is allowed to alsorb heat from the extenor air 1. doing so, it turns to vapor, much as

water turns to steam when he aterimalic at The pressure of the expanding air drives pictors in a pair of cylinders. Through an elaborate system of auxiliary apparatus, virtually all the energy contained in the liquid air is reported to be recovered. Because of its efficiency and small bulk of fuel



#### HOW SPIDER WEB IS PUT IN TELESCOPES



and other optical instruments to a sighted with precision, science has to find a suistance that can compare to thomess and permanence with spider's sik. Photographs reproduced here show the little known but his consting process of preparing the threads from spider webs, as it is carried out in one of the world's large-

est optical bouses. A needle with a bent tip, a pair of tweezers, and a magnifying lens are the only tools employed by the skilled craftsmen who perform this descate task. The first step is to draw out a single strand of silk from the spider web, and to weight each end with small balls of wax. Hung up to dry for twelve to fifteen hours, the thread shrinks to a fraction of its former diameter. Next it is cleaned with either, amouthed, and re-

A weighted spider web is lend across the exeption in serials.

stretched. With these preparations completed, the weighted thread is hung across the eyepiece of the telescope, and secured at each side of the rim by a dab of colorless variash. Superfluous parts of the thread, with their weights, are cut off and removed as soon as the variash has dried. Additional gross-lines are similarly applied uptil the desired pattern has been built up, depending on the type of instrument for which it is made.

#### RANGE FINDER FOR HUNTERS

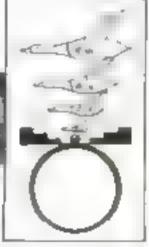
By instantly giving a duck hunter the range of his target, a new attachment for a shotgun is said to improve the shooting of a novice. This simple form of range finder consists of a night with a series of notches of graduated width, which is chipped to the end of the gun's muzzle. To find the range of a duck on the wing, the hunter need merely observe which of the notches matches the apparent length of the bird. The smailest notch

shows a runge of sixty yards, and the other two indicate a fifty-yard and forty-yard range, respectively, while the entire width of the special sight shows a runge of thirty yards. Knowing the cance, the hunter estimates the bird's speed of fight by a method devised by the inventor

#### BIRD LEADS GLIDER

That air pilots can still learn from the birds was recently demonstrated in South America. By trailing a buzzard near Rio de Jamero, Brazil, Peter Riedel, a member of a German gliding expedition investigating the air currents of South America, was able to attain an altitude of 7,000 feet in his motorless craft.





#### COLORED LIGHTS SHOW SPEED OF AUTOMOBILE

COLORED lights reveal at what speed a car is traveling, in a new safety signal devised by a Schenectady N Y inventor. When the car is moving slowly forward, a red light shows to the rear. As the speed increases to twenty-five miles an hour, the light automatically changes to blue. At thirty-five miles an hour the signal becomes yellow; and, above forty-five miles an hour, green. Thus the inventor aims to reduce accidents in passing another car, particularly at night when the speed of the overtaken vehicle is difficult to estimate by ordinary methods.



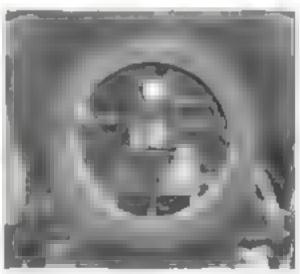
#### FACTORY FIRE ESCAPE IS "SLIDE FOR LIFE"



Cinco up view of aliding loop used in new tre encape

RIVALING the "alide for life" of a circus acrialist, one of the strangest of fire escapes enables workmen in a Canadian refinery to save them-selves in case a sudden conflagration traps them on top of a tower. An inclined cable has been rigged from the top of this structure to the ground, and from it has been hung a traveling loop capable of supporting a man a weight. If fire occum, a workman on the tower thrusts one leg through the loop and whizzes to earth,

checking his precipitate descent with a hand brake. As soon as he steps free from the loop, a counterweight returns it to the top of the tower for the next possenger and the process continues until all are in safety.



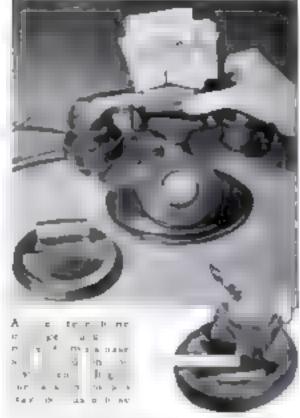
Light mounted at year of car shows different colors to indicate speed at which it is going

#### SEAPLANE'S HULL RESEMBLES A SHIP



Standards, cutter, hydro-guder—what would you guess the strange craft shown in the accompanying photograph to be? Actually it is the hull of one of the world's largest flying boots, now under construction in a French factory. When completed the machine will have accompositions for eighty persons on its two decks, and will have a cruising range of 2,800 miles between stops for fuel. Six water-cooled motors of 1,000 horsepower apiece will drive it at a speed estimated to reach as high as 150 miles an hour

The giant ship is to be placed in transplantic service on the French air line between Paris and Buenos Aires, Argentina Originally this line carried only air mail, and fast dispatch boats plied the overwater part of the route between Africa and South America. Recently transatlantic mail planes were put in service, enabling the mail to be flown all the way. The new air giant will permit passengers to be carried as well. It is expected to be ready for service in June, when the new service is scheduled for inauguration.



#### RACK HOLDS TELEPHONE MESSAGES IN VIEW

A HEMPSTEAD, N Y., business man has devised a handy desk accessory to keep telephone messages from being mislaid or overlooked. The base of this device serves as an ash tray, while a detachable message rack is provided with a pencil for jotting down messages and a clip for holding them. Removed from its base and rested upon the telephone, it confronts the user, upon his return, with all the messages received while he was gone. At other times it serves as a decorative ornament for the ash tray.



#### "BREAKS IN" NEW PIPES

A LITTLE robot that shoulders the task of "breaking in" a new pipe is now available. When the pipe is lighted, its mouthpiece is thrust into a section of tubing, and a rubber ball is squeezed occasionally. The smoke is exhated through a slit in the ball. After an ounce or two of tobacco has been consumed, according to the maker, the pipe is ready for smoking, free from the biting taste of varnish.

#### COP CAMERAMEN GET PICTURES OF WRECKS

So orres have photographs fixed responsibility for car crashen that the Chicago police have established a permanent camera squad to snap pictures of accidents. Twelve cars equipped with cameras, first aid kits, and brake testers, cruise the city, listening for radio calls from headquartets. When a truffic smash is reported, the cars much to the scene and photograph all angles. Thus, impartial evidence is obtained for use in criminal and civil cases. The photographs will also be of value in safety-campagn work for the education of drivers



Chicago policemen photographing the scene of a greak

#### STREAMLINE AUTO TRAILER HAS SINGLE SWIVEL WHEEL



New streamline auto trailer for carrying laggage. Note the single swiveled wheel that supports it

Modern streamline ideas have been appured to a new one-wheel automobile tracer for carrying luggage. The trailer consists of a rounded hood fitted over a sice, frame which is attached to the frame of the automobile by bingelike couplings. A lid at the rear gives access to the interior. The trailer rides on a single wheel mounted on a swivel, and the tire is a modification of an airplane tail-wheel tire. The custerlike wheel, being free to rotate, adapts itself readily to irregularities of the road. When the car is backed, the swivel turns.



Triumph of Science Makes

BIG BUSINESS

### By Edwin Teale

LRSTS of specifisphilage one ship a n as thef's test took he supply have on a name of the reas sure a local to ter most on of named win er sport of American rans. at is the life game a the domor seconds his man thousand presides said a si arms. Malison Square Carrier in Sw York ( y to so a game between track professionals. The agricult he country Bluve's are increasing ocers at he game. is ready new lans are bring to runnil Hage rinks or hoesely may be state anoner engineer in 1 m seemal came are play the last in the garries from coast in class. great stong the season will a nervelinging Wir Is Series i the Ice the arnual la tie of the Staples Cap. Pre-kants no other spor lever zoomed to such seasationa popularity a so short a ime-

The secret of backey's appeal is sample. It is the fastest roughest, bardest in ring

by heated rooms, as we water the threle and spels of the lookey

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Left an enciting moment in a hockey game. A defense man a rushing up to take the suck after goase has made a save



Three views of the goal e in schongreshown. shove and at right. In one he han fallen but in stopping the puck with his hand Upper right. kneeling on the ice, he stops the puck with the back edge of busstick Unable to prevent a goal any other way, the goabe is doing m aput and stop ping the puck with skate blade



THE SEC THE SPECT SEA OFF t pret as ma backey Las var want the a he he mantes Cup has lewas saigning at any down the ice, the bunched play rs of he New York Rangers and he Toron a Major Lea sawment rem

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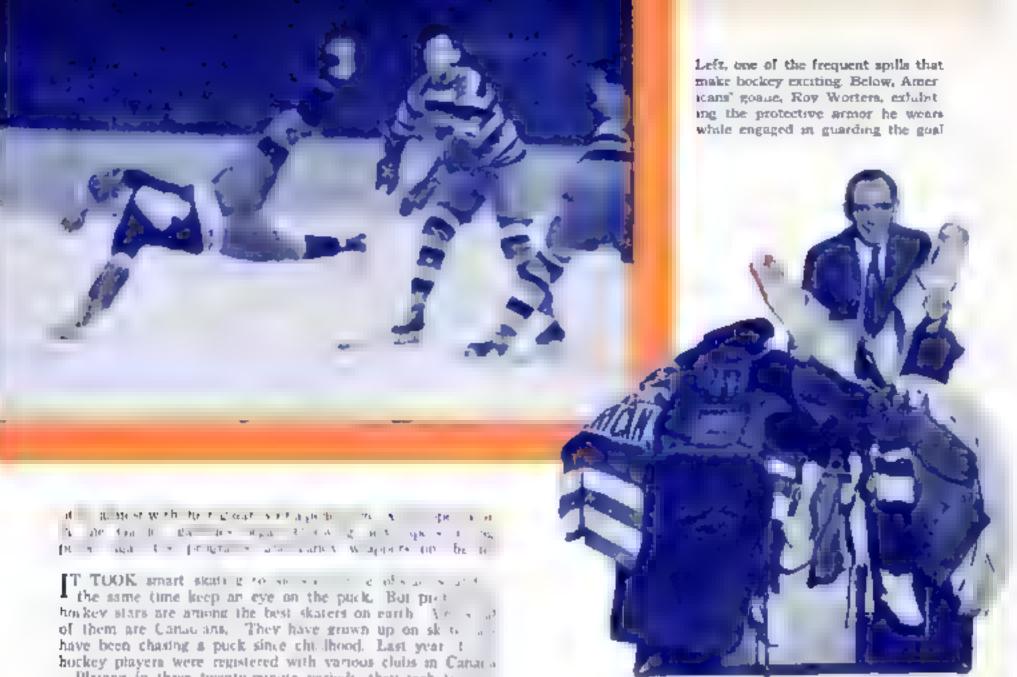
the tosa was \$150 (or alcates and shoes arone. Andition

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Playing in three twenty-minute periods, they neek to a into a net four by six feet in size a three-inch vulcanised rubber disk, using curved sticks a lattle more than four feet long. Each team has aix players, Goal. Right Defence, Left Defence, Center Right Wing, and Left Wing. The game is a high-speed version of "shinny on the ice," played with such reckless abandon by professionals that one sports writer describes it as "a combination of forked lightning, old-fashioned shinny and second-degree murder,

Rink hockey, such as in popular in the United States, in far harder on a player than the outdoor game of Canada. Playing at top speed in a damp, close almosphere, the average star burns himself out in five years. His legs give out first. The average big-time hockey player weighs about 155 pounds. "Ching" Johnson, defence ace of the Rangers, is an exception, tipping the scales at 210. Training begins about three weeks before the season opens in mid-November.

The veteran of the game is Bul Cook, probably the greatest right wing of all time. He has been in professional hockey for twenty years. Last year, for the second season in succession he was high-point scorer in the National Hockey League Twenty-right times, the red light behind the opponent's net fashed on to indicate goals he made. After the four-months hockey season each year he retires to his wheat farm in Saskatchewan. His brother, Bun Cook, is also a star of the New York Rangert. Some years ago, a professional team in Canada was composed of nothing but Cooks, five brothers and a cousin making up the sextet

One side light on how interest in bookey has climbed in recent years in the rise in value of a franchise in the National Hockey League. In 1924, when the league was just getting under way a franchise for one of the big cities cost about \$5,000. By 1929, it had increased to \$75,000. And, today, it stands at a hundred times its original figure, approximately \$300,000.

In the league, last year, there were nine teams, the New York Rangers, the Boston Bruns, the Toronto Maple Leafs, the Montrea, Maroons, the New York Americans, the St. Loins Eagles, the Detroit Red Wings, the Montreal Canadiens, and the Chicago Black Hawks. Five of the teams were American, four Canadian. The Boston Bruns, alone, grossed in gate receipts more than a quarter of a million dollars.

A chief drawing card of the Brains is Eddie Shore, "the human gyroscope." Hard to upset, he moves over the ice like a whirlwind. In action, he has been described as "most resembling the rear end of a transcontinental bus out of control on a steep bill." The eleventh-bour trick of the Bruins is the "Shore charge." Taking the puck in his own territory, Shore launches full tilt down the ice followed by two of the famest forwards, Nearing the enemy net be lifts the puck and crashes it not into the case but against the backboard. His momentum carries him through the opposing defense. He retrieves the puck and aboots it back to one of the forwards who has just swooped into position for a shot that flashes on the goal light

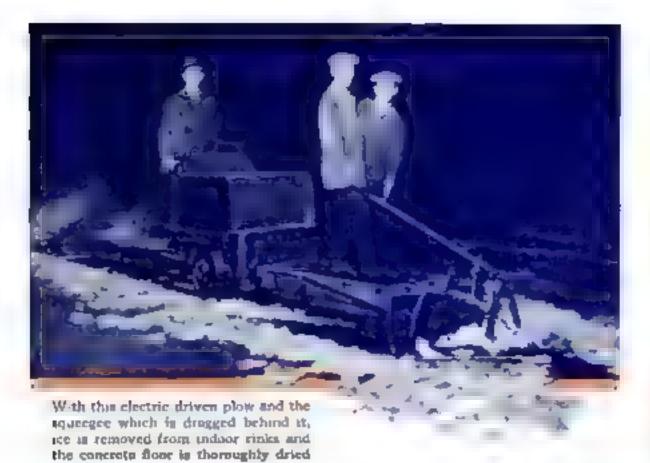
Off the ice, Shore is mild and soft-spoken. Careful about his physical condition, he neither drinks nor smokes and on trips always takes his own drinking water with him. Summers he cases page on an Alberta farm. But in the heat of a game he goes wild and his reckless playing has brought him a record number of injuries. He carries more than thirty scars and nearly 500 stitches have been taken in his anatomy during his playing career. Once, after he had defeated an opposing team almost single-handed at Montreal, he left the ice with a broken nose, a broken jaw, two black eyes and six teeth missing

Another Spartan of the ice, Ching Johnson, defence man of the Rangers, played through a Stanley Cup match wearing an alumnum protector to hold a broken jaw in place. In the same game, red-headed Resmald Horner of the Leafs, shot the winning goal with a broken hand encased in a plaster cast

Although bockey is a high-speed game played on a hard surface, the men never wear belinets. Last year, a step in this direction ended in a fiasco. Two Montreal Canadiens, Gagnon and Mondou, skated out on the ice wearing queer black headgear suggesting derby hats aboved down over their ears. When the band struck up the National Anthem, which is a preliminary to every game, Gagnon couldn't get his helmet off and when the game started, Mondou couldn't keep his on. That ended the belinet idea for the time being.

Shin guards, shoulder pads and knee protectors form the meager armor of the players with the exception of the goalie, who is mattressed with extra padding to withstand the blows of the winzing puck, and the roughing he gets in close play. Last year, a new ruling went into effect to aid the goal tender. It prevents players from crossing a tipe fifty-seven inches from the mouth of the goal unless they are carrying the puck.

Another curious rule was added to those already in force by officials of the National Hockey League. It specifies that all players must wear skates! It seems that some years ago, a



Showing how players get

huct. Note stick land

ing across man's face

goalie was injured in a game at Iroquots Falis, Ontario. Having no regular substitute, his team sent in a spectator who could play lacrosse but could not skate. He wore rubber overshoes. The opposing team set up an indignant shout. But when they consulted the rules they could find no specific provision that players had to wear skates. So, last year, N. H. L. officials de-

cided to prevent future misunderstandings by adding the rule every one had taken for granted.

A few years ago, when the rules were altered in connection with substatutions, the manager of the Chicago Black Hawks tried to apply a football idea to hockey. He developed two teams, one a.most as good as the other and shifted them at eight or ten-minute intervals during the game. One equal was driked at offense, the other at de-fence. When the tide was running against the Hawka, the defensive aces went in and blacked the elashing attack of the opposing squad, when the enemy was on the run

the scoring crew took up the battle One of the longest professional hockey games on record took place two years ago between the Boston Bruins and the Toronto Maple Leafs. It lasted two bours and forty-four minutes and ended in a one to nothing score for the Leafs. In bockey high scores are rare. Goals are hard to make. Such defensive stars as Andy Aitkenhead, of the Rangers, and Lorne Chabot, the lean goalie of the Leafs who has worn the same lucky trousers in every game for five years, have run up phenomenal records in goal tending. They stop the puck with bands, feet, skates, stick and body. Out of 137 shots by opponents in five games, Artkenhead stopped all but nine. And one of these was a freak drive that landed in the net by luck.

It occurred during a nip-and-tuck battle between the Rangers and the Leals, leaders in the race for the Stanley Cup. Her Kilren, of the Toronto team, shot a high one down the scratched and powdered ice. The skimming puck bounced off the bald head of Ching Johnson and skidded into the oct. Usually a sexiet that can shoot the rubber disk past the goal tender into the net three times in an hour of fighting stands a good chance of winning the game. That is the average score of highing contests.

Because the taut netting at the back of the goal cage sometimes caused the puck to rebound at high speed so the referee could not tell whether a goal had been made or not, the design of these wire enclosures was altered a few years ago. Now, most of the cages have at the back wire deflectors shaped like huge reversed shin guards. They keep the puck within the cage once it enters the mouth.

After every game, players have their skates sharpened. In a basement shop across from Madison Square Garden, one expert, Warren Roach, does all this work during the New York season. The runcers are ground on a subberized wheel stoned and then finished with a subbing of oil. Sometimes as many as 150 skates pass through his hands in a single day

The beginning of bockey dates back to 600 B.C. or before. In 1922, archaeologists unearthed an ancient sea wall near Athens, in Greece. On it they found carved in has re ief the figures of athletes striking at a ball with curved sticks. The carvings were twenty-five centuries old and dated to the time of Themistocles.

The Astecs in Mexico played a similar game and a favorite pastime of the American Indians was thasing a ball of deer-skin or a pine knot, with curved sticks. Sometimes, the dried seg of a deer was employed as the stick. When the earliest French settlers occupied the region of the St. Lawrence, they took up the sport and it has become the traditional game of Canada.

In the United States, outdoor hockey has remained a minor sport. The recently organized Intercollegiate Quadrangular Hockey League brings Yale, Harvard, Dartmouth, and Princeton together in an annual series for the Hobey Baker Trophy given in bonor of the famous Princeton athiets of twenty years ago. But few, if any, collegiate bockey stars ever make the professional teams.

It is rick bockey, with its whirlwind skating and brilliantly reckless offensives, that is a modern American development. With gate receipts soaring to seven figures, with players drawing as much as \$7,500 a season with [Continued on page 109]



Hockey skates must be sharp and accurely fastened to shoes, a job that keeps this man busy

# Simple Home Tests of Scientific Problems



### CELLULORE THRUE STOPS

ACTION OF BURKING GLASS

With a bright out thining a burning glass on you know can be used to set fire to lent or even to dry leaves. If a pure of cellulour theory a band between the lenn and the sun the toffer mable materia no matter how dry it may be, cannot be ignited. This is because the travel or early and the to re-red rays that the propose ble for the action

#### BAS SURMS WAYER

To show that water is formed when gas burns, hold a flat iron ever a gas flame fac a second or two. When it is removed you will find so much dew us its surface that you can wrive your name in it. Obviously the experiment also indicates the presence of hydrogen

#### WATER GOOD BOUND CONDUCTOR

To show that water is a botter conductor of sound then air float a piece of wood in a jar of water as above Then at he the time of a lock to make them withrest and hold the end of the fork against the wood. The volume of should in greatly received as the around waves are transmitted into the ar by the water



To understand the working of an atomlast arrange t with a medicine dropper as at right. The atomical contents water. Blowing a atriam of atrition the hor santal dropper into the atom ser will force the water up the atom ser a tube and then out of the dropper into the air so fine drops that form apray



### OF E ECTRICAL IES.

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#### NICE LITTLE EXPERIMENT IN HEAT CONDUCTIVITY

The question in, which is the better hear insulator cork or paper? To find the answer wrap a bit of usus paper allout the and of a cork i pped eighter ette as shove. Then hold a lighted match under it. The paper over the cork will be charted thus demonstrating that paper is a better heat conductor than each around the expectice.



#### RAISING BIG WEIGHTS WITH A SIMPLE PULLEY

Rig a pulley as shown, with a plane and scales attached. Purling down on the scales will raise the plane ball as far as the scales descend. This accounts for the mechanical advantage. If the scales read one pound, it is obvious that the plane's weight must be exactly twice this, or two pounds

# New Kind of Planet Finder

### YOU CAN MAKE AT HOME

... Simple Device, Showing Position of Bodies in Our Solar System, is Fully Explained in this Article

which make up a given constellation—such as Taurus or Scorpto—you can always rely upon finding them in their places, year in and year out. But keeping track of the five naked-eye panets—Mercury, Venus, Mars, Jupiter and Saturn—is more difficult. They are constantly shifting their positions from constellation to constellation along the road of the ecliptic. This steady travel accounts, in fact, for the very word "planets," which means "wanderers."

The easest of these planets to keep in sight are Jupiter and Saturn—for the former takes a whole year to travel through one of the twelve sodiacal signs of conscillations, and the latter remains over two years within a single sign. So if Jupiter is in Labra (the Scales) this year, we can rely upon finding it in Scorpio next year. And since Saturn is now (January I, 1935) on the boundary between Capitalian (the Goat) and Aquarius (the Water Bearer), we can locate the ringed planet next year in the latter constellation, and only a little advanced in the sign, at that

To find these two planets after once seeing them, requires no apparatus, but for keeping track of the three much more rapidly shifting ones—Mercury, Venus and Mars—a "planet finder" is a convenience, as well as a simple bit of construction which is fun to carry out.

The necessary apparatus consists of a transparent drom of sheet celluloid (or several layers of transparent wrapping folded together) and a series of five identical care loard rings to slide easily around it like five narrow band rings on a single finger. There must also be a fixed ring at the bottom to support the five movable ones, and another fixed ring at the top to

By
GAYLORD
JOHNSON

keep them in sliding contact with each other A liny knob of wood, glued to the outside of each movable ring, aids in turning it.

In cutting the transparent strip for the drum, leave about an inch beyond the map for a cementing-lap Then, on this transparent strip, you trace

with a pen and white ink the diagram given across the bottom of these pages. If the celluloid surface will not take ink readily, wipe the surface with a cioth mossened in soapy water, and dry

After the pattern is accura cly drawn in white outline, cement the ends firmly together with clear cement. Then channel a circular groove (to fit the drum's lower edge) into a piece of heavy pulp board cut into a rircle. Into this cement the transparent ring

The transparent circular cap you have made now represents the rod at throughout the year. When he d with the current date on the far side opposite your eye, the constellations seen facing you are

FIAED DATE RING
F XED DEGREE RING

WAING THE PLANET PINDER Early planet in contaminate by

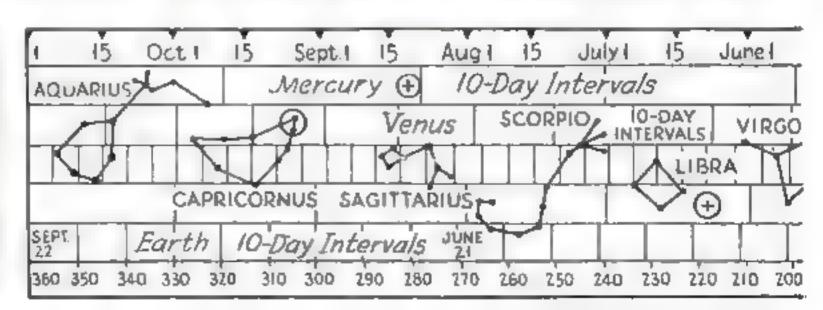
USING THE PLANET PINDER Each planet is represented by a white dot on the black inner surface of ang of the movable card-board rings. As the ring is moved the dot passes through a map of the cutate! at one of the codiac drawn in white ink on the transparent three drawn. The distance traveled by each planet in a fixed time interval is shown by vertical marks across its path. By counting forward from a mark showing its position on Jenuary 1 1932, its position is its orbit at any future time can be see by determined.

the sociacul star-groups which are in view when you face the southern horizon at 9 r.m. on that date. But keep always in mind that this date-hand has nothing to do with locating the planets on the ecliptic. It merely shows you when the soding constellations are visible.

As you turn the drum from your left hand toward your right (clockwise) the twelve coestel a sons pass along the strip of minia are sky just as they do throughout the year in the real sky

The small open circles marked at various points on the drum, along the five paths for the planets represent the post-tions of Mercury, Venus, the earth, Mars, and Jupiter, as they would be seen from

MAP OF THE ZODIAC To make the inner drum of the planet finder, track the two diagrams at the right spon a strip of clear celiu old or a roll of transparent wrapping material. Cement the anda to form a ring and mount on the base. The circles phow the positions of the various planets on Jazuary 1, 1935. They may be made more conspicuous by outlining with red water color. The planes rings are made of strips out from Bristol board with blacksped incides and a while dut to represent the planet each indicates





ASSEMBLING THE RINGS. This photograph shows how the cardboard placest tings are all pad over the transparent drum. After all five are in place, the fixed upper date ring" is comented to the top of the drum. A small knob of wood, a sed to the outside of each ring makes it easy to allife the ring around and follow the movements of the planet through the radiac

the sun against the nodioc constellations on January 1, 1935.

Each of the large white dots on the inside of the black sliding cardboard rings which surround the transparent zodiac-drum represents a planet. When the five rings are all in position, the whate planet-dots show clearly through the transparent dram and each moves as its ring moves.

Accordingly, since each of the planet paths is marked off in regular time-travel intervals, it is easy to find the position of any planet, as seen from the sun, at any numher of days, or even years, in the future-counting from the planet's position as marked for January !, 1935

For instance, you wish to locate the position of Venus on May 1, 1935. From January 1 to May 1 is 120 days. This means that you must turn the white dot on the second movable ring through twelve of the ten-day intervals marked on the strip devoted to Venus. Begin at the planets marked position for January 1

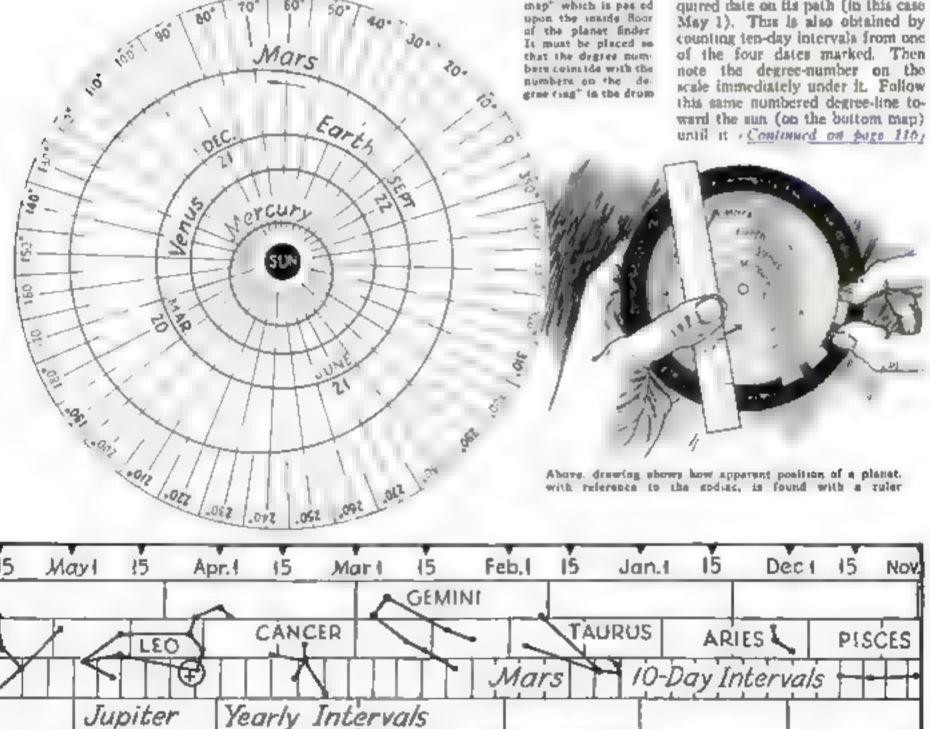
> At left the degree map" which is pee ed

1935, and set the dot so that it coincides with the small circle indicating its position on that date. Then count off exactly twelve ten-day divisions along the path of Venus in a counterclockwise direction (from right to left along the visible half of the sodiac) and turn the Venus-ring until the dot shows through at the twenfth ten-day division. This dot then marks the position of Venus as seen from the sun on the soduce at May 1, 1935. (Its "hestocentric" or "sun-centred" position)

To find the position of the planet as seen from the sorth at the same time (its "geocentric" or "ranth-centered" position) we shall need to make use of the circular map of the planets' orbits, which must be traced off and pasted inside the bottom of the transparent drum. Note that this map is divided, from center to circumference, into degrees-from seru to 360. Paste in the map so that the degree numbers coincide all around on both map and drum.

In addition, we must make use of the movable ring which carries the dot representing the position of the earth as seen from the men. (Its "heliocentric" position). This dot must first be put into its correct position against the sodiac.

To do this, turn the ring until the earth-dot shows through the required date on its path (in this case May 1). This is also obtained by of the four dates marked. Then note the degree-number on the scale immediately under it. Follow this same numbered degree-line toward the sun (on the bottom map)



DEC 21

90

80

70

60

50

40

30

20

100

MAR.

180

170

160

150

140

130

120

HO

190

10

SEPT 22

### ANYONE CAN BUILD THIS

# Band-Spread Receiver

Here is the author of this article winding one of the plag-to colds used with his improved two-tube receiver. Mole the arrangement of the four controls as they appear when installed on the from panel.

AND-SPREAD tuning plus up-to-the-minute parts make this receiver the last word in easily built short-wave circuits. It is the logical successor to the one-tube set that usually serves as the beginner's introduction to the higher frequencies

Atbough diagrammatically the regeneral ve-detector resistance-coupled empiries book-up appears for from revolutionary, several changes and improvements make for better all-around operation. First of all, the circuit is built around two tubes of the latest vintage, a screen-grid 6D6 detector and a type '76 amplifier. For amoothness, regeneration control is dependent on the screen-grid voltage to the 6D6 varied by means of a 50,000-nhm carbon potentiometer (R\*)

A change for the better has also been made in the variable condenser arrangement included in the antenna circuit. A new type of airpadding condenser has been substituted for the inexpensive, but

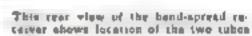
hard-to-control, equalizer or trummer con denser (5 to 35 mmf) generally used. Being in reality a stordy miniature variable condenser whose tiny semi-circular pla esmeasure less than seven sixteen.hs of an inch in radius it overcomes all the daticulties associated with the two-plate micatype. It is easy to adjust and, because of its rigid multiple-plate construction, bolds its setting regardless of vibration or temperature changes. As with any circuit of this type, this condenser is included to provide a means of balancing the receiver to make it oscillate over the full mage or band for each of the four plug-in rolls. In the completed receiver, it is mounted under the chassis with its adjusting slot projecting above the top face. It is regmated with a screw driver

Since it eliminates troublesome crowding by spreading the slatious over a great-

By LEWIS WINNER

Underview of the eqt. Note the recently developed are padding sundenser it is the midges of all midges condensers

er portion of the tuning dial, the hand-spread feature of this receiver is particularly valuable to the active amateur It is obtained through he use of two condensers connected in parallel across the grid winding of the plag-in cor, cir cunt. Condenser C1. mounted under the chassis, is the course or bandsetting unit, while C1, adjusted with the large central dial, is the final



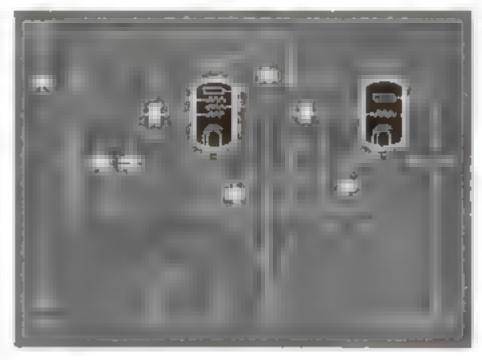
tuning condenser. In use, once C'has been set for a given frequency band, tuning within the band is accomplished ent re v with C'

Aside from the 2-by 7-by-10-in aluminum chassis and the 7-by-10-in, a uninum panel the following easily obtained parts are used in the construction of the set.

C'-Variable condenser, 140

C\*.-Variable condenser, 35

C3 -Vapable air-padoing con-



denser, new utra-midget type, 50 mmf.

C\*.—Fixed condenser, .00025 mld.

C\*—Fixed condenser, 91 mfd.

C\*.—Fixed condenser, .1 mfd., 200 voits. C\*.—Fixed condenser, .25 mfd., 200 volts.

C\*.-Fixed condenser, .00015 mfd.

R1 -Grid leak resistance, 1 to 5 megs.

R<sup>2</sup>.—Potentiometer, 50,000 ohms. R<sup>3</sup>.—Fixed resistance, 500,000 ohms.

R4.—Fixed resistance, 10,000 ohrns, 2 watts.

R' F xed resistance 100 000 ohms.

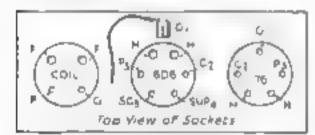
RFC—Radio frequency choke, 2 mb Miscellaneous. Four four-prong coil forms, wire for coils, one four-prong isolantite socket, one six-prong isolantite socket one five-prong wafer socket, one type 5D6 tube, one type '76 tube, one power terminal strip, one phone terminal strip, one antenna-ground terminal strip, one single-pole, single-throw toggle-switch, dial, knobs, screws, solder, etc.

If you have constructed any of the other simplified short-wave circuits that have appeared recently (P. S. M., June '34, p. 64; July '34, p. 64; Aug. '34, p. 66, Oct. '34, p. 63), you undoubtedly will have some of these parts on hand. However, before using them make sure that they are in working order and match the

specifications to the letter

The set of four plug-in coils used can be home-wound at of commercial manufacture. Complete winding specifications are given in a convenient tabulation elsewhere in the article. For coil forms, the author used a relatively new type known as the "rib-grooved" form, having an effective diameter of one and one half inches. To simplify matters, thamseled wire is specified for the grid windings of each of the four coils. An improvement incorporated in the originals shown, however, consists of using silver-plated wire for the grid windings of coils A and B

Although in the circuit diagram no common chassis connection is shown, the wirns, can be simplified by those who desire, if the metal of the chassis and panel is made to serve as the common cathode and negative A-battery lead. In this case, of course, the ground terminal will be grounded directly to the chassis. If the socket drawings are followed in making



the connection to wirth difficulties should be encountered. The numbers on the socket terminals shown directly above agree with those on the tube diagrams on the opposite page

A little practice may be required before you learn how to use the band-spread condenser arrangement to best advantage, but once mastered, it will enable you to saft through the jumble of stations on each of the amateur bands. For your first try, simply set the main condenser C<sup>2</sup> to approximately twenty on the dial and then turn condenser C<sup>1</sup> until you hear the "chirps" that indicate stations. The final adjustment of C<sup>1</sup> should be approximately in the center of the busiest area on the dial, Condenser C<sup>2</sup> then can be adjusted

# Hides AUTO RADIO under Floor Boards



In this photo is shown the saw method of inscalling an auto-radio besseath car's floor bounds

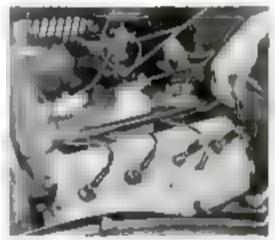
ALTHOUGH most radios in automolecus are mounted under the
instrument panel, they can be
installed almost anywhere in the car.
How one ingenious fan made the most
of remote control to hade his receiver
under the year floor boards is shown in
the photograph above

No special equipment was needed for this thirtallation a standard commercial receiver of the unit type having a flexible tuning shaft being used. The receiver box was mounted under the rear floor boards in a water-tight metal compartment, a hole being cut and protected with a grille to expose the speaker, while the remote control was fitted into the upholstered arm at the right of the rear seat. It was a simple matter to thread the flexible tuning cable through the side uphoistery to the receiver, while the necessary battery connections were shorter than those usial y required

Aside from the convenience of having the receiver controls handy to those in the rear seat, the owner also finds that the new position of the receiver and speaker improves the tone and sound distribution. Other variations of the same idea would be to mount the receiver under the rear floor boards and the tuning control on the steering wheel post or to install the receiver and control in the usual way and merely hide the speaker under the rear floor boards

With auto radio entering its third year of popularity, muny new accessories are on the market. Newest of these is an ignition noise eliminator. Differing from the usual suppressor, which in reality is simply a resistance, this new unit is a carefully designed radio-frequency choke. According to its manufacturers, these noise filters have high impedance to radio-frequency oscillations and exceptionally low resistance to the low-frequency components of the ignition mantks.

Along the same lines, the perfect shielding of the newer cars being designed for radio makes it possible, in most cases, to climinate all but one of the suppressors used heretofore. Instead of the usual units connected to the spark plugs and distributor, a single unit of a slightly modified construction, inserted into the center high-tension lead to the distributor head, may be used with good results.



The manner of replacing the suppressort, left, with the new fivers, right, is shown above

to spread the stations in that band. By repeating this process with each of the four plug-in coils, settings for C<sup>1</sup> will be obtained for the center portion of each band. By midicating these points, condenser C<sup>2</sup> can be adjusted quickly to currespond with the particular coil being used.

#### COIL SPECIFICATIONS

C. d. Tichier (L.) Turno Grid (L.) Turno

A. 17-41 M. 3.5-No. 32 DSC. B.3 No. (6 Enam.- 7 per fech.

B. 53-73 M. 5.6-No. 52 DSC. 17.3-No. 20 Enam.-12 per fach.

C. 66-150 M. 10.8-No. 32 DSC. 17.7-No. 24 Enam.-24 per fach.

D. 135-270 M. 16.3-No. 32 DSC. 61 7-No. 28 Enam.-44 per fach.

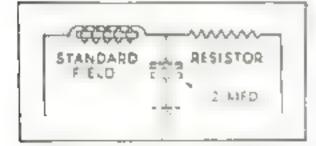
Tickler spaced M in, from grid coll, both wound clockwise on lorus of 15% in, effective diagrates



#### Cutting Out the Hum on Home-Built Receiver

XCESSIVE hum undoubtedly is the most common source of trouble in er. If the set is of the alternating current type, the logical conclusion is that the power supply is at fault. An unshelded grid condenser and grid leak, bowever, can he an equally proline source of hum. To remedy this on screen-grid detector receivers, use a postage-stamp size condenser in conjunction with a small half-watt geid leak and mount them directly on top of the detector tube grid clip at shown. The shield for the tube then will cover the condenser-grid-leak combination at well, To eliminate possible grounds, the metal shield cap should be lined with cardboard, If this fails to remove the hum, try grounding one heater line at the detector tube socket before laying full blame on the power supply.- J. A. Worcester, Jr.

#### Simple Way to Match Your Dynamic Speaker



In this desgram a simple way of making any spagker, whose field resis ance to less than the or g nal, serve with your set is clear y indicated

WiteN a loudspeaker in a commercial broadcast receiver fails, the pwner often is unable to find a replacement whose field resistance exactly matches that of the original. However by following the simple procedure outlined in the diagram, above, any speaker whose field resistance is less than the original can be made to serve. Simply connect a ten-watt, wirewound resistance of just the right value to bring the total resistance up to that of the original in series with the new field. If a slight hum results when the substitution is made, connect a two-microfarad, 300-volt condenser between the circuit and ground as shown by the dotted lines in the drawing.-J. P KENNEDY

### New Flexible Battery

RESEMBLING a buside of dynamite stick Roman candles, the L. in radio B batteries i flexible unit especially signed for portable Called the "ribbon tery," it can be folded a rolled to fit the available space. In fact it even be worn around the l under the coat where I maum portability is required. Manufactured is two men, the particular battery shown is the larget 114-volt type, The smaler unit. resembling A cartridge belt be-

cause of its twoand three-quartermeh width, provides a twentyeight and one-halfvolt Brupply Since boxes and beavy wax are chiminated entirely, these flexilile batteries are fully twenty-five percent lighter than rigid batteries.



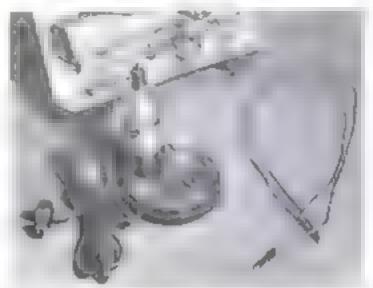
#### Pocket Mirror Proves Handy Radio Tool



STRANGE as it may seem, a small packet vanity mirror can be put to good use in the radio experimenter's tool kit. Held under various parts inside the chassis of a receiver, it can be used to read hidden specification labels when selecting replacements for facilty units. Invariably, the port in question is soidered in so that as label is on the underside, but the mirror trick solves the problem. Incidentally, he mirror also comes in bandy to reflect light into the dark recessor of a cabinet and thus make it an easy matter to see and study the various parts that are otherwise invisible. A small dental mirror also is bandy when inspecting soldered joints.

### Cheap Tube Tester for .Imateur Experimenter

WITH the memperative tube tester illustrated any rauto set builder can afford to check his supply of tubes for leaks and shorts. Arranged to accommodate both large atxl small four-, five-, six-, and seven-prong tubes, it indicates leakages up to a milion ohms as well as threet short circur -All that is necessary is to plug the tester into any 110-volt one, insert the tube to be tested, and watch the small neon lamp at the rear of the panel. If it glows, a defective tube is indicated. A pair of jacks and test leads also are included.

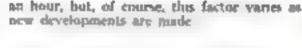


An inexpensive tester to check tubes for sharm and leaks

Define a strong wind, a gale, and a hurri-cane.—E. H., Richmond, Va.



A .- TREMNICALLY, the difference lies in their speed. According to the United States Weather Bureau, a strong wind is one ranging from twenty-five to thirty-eight miles an hour, a gue is a wind blowing from thurtynine to fifty-four miles an hour, while a hurricane is one blowing faster than seventy-five pules an hour. When a wind blows between fifty-five and seventy-five mises an hour it is called a "whole gale"



#### How High Are the Tides?

D F G., severago, n w Few sections of the world's constitues experience the same rise and fall of tides. Much depends on location, Tides yary from less than a foot along the coast of Panama to more than sixty feet at the Bay of Fundy, N B.



H. B., CLEVELAND, D. When a crab or a lobster finds his leg or a claw raught in a trap he simply discards that particular member and escapes. This leg-discarding action is ontirely automatic, the injury causing muscles to contract which pull the leg up and literally pro it off by pushing it against the body-shell. In a short time, a new log or claw grows out of the old stump



G E V., ATLANTA, GA. A long tube filling with water as the buoy tosses in the sea is responsible for its whistle. Air trapped in the tube as the buoy rises is forced out through a whistling pipe when the buoy falls. The water, rising and failing, acts as a piston to atternately suck the air in through a check valve and force it out through the whistle.

#### We've Heard of Snake's Hips

Q.-us it true that analysis having legs sometimes are found?-T T, Watertown, N Y

A.-ALTROUGH the story often is told of anakes sprouting legs when thrown into a fire. there is little fact to back it up, Prehistoric snakes undoubtedly boasted less but the chances of finding a leaged snake today esperially among the common North American varieties, is extremely slim.

### Mississippi Mud

C. L., MEMPINE, YENN It is estimated that the Mississippi River dumps more than 400,-000,000 tons of dirt into the Gulf of Menco every year

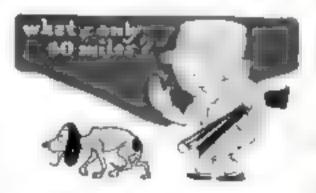
### Airplane Speed Limited

F T Y, stress will, sa. Besides the human factor, the speed of the modern airplane is limited by the maximum possible speed of the internal combustion engine used to drive if. At present, this is placed at about 600 miles

#### When the Parachute Fails

Q -- writer a pilot jumps from his plane at 4,000 feet and does not open his parachute until he has almost reached the ground, how fast is he traveling at the moment the 'chate opens? 3 B S., New York, N. Y

A 17 is mought that a falling body reaches a maximum speed of about 200 miles an hour after falling 2,000 feet. From that point on, because of air resistance, it continues to fall at the same speed.



#### Wanna Race a Duck?

H D 1 NEW HAVES COYS Speeds of forty and fifty miles an hour often are at tained by the elder duck, according to the American Museum of Natural History

#### Just Sales Talk

Q-ts ove borse power equivalent to the strength of one borse?-O. P., Seattle, Wash.

A .-- wor exactly. When James Watt tried to sell his steam engine as a substitute for borses, he sought to compare its power with that of the average horse. Borrowing a brewery horse, he found the animal could do 22,000 foot pounds of work a minute. Then, allowing for generous losses of fifty percent, he decided that 33,000 foot pounds a minute was the average home's power It is whispered that Watt, mixing business with science, placed the figure ridiculously high for fear of some day meeting a super-horse that would outwork his engine.

#### Porcupine No Marksman

Q.—15 it true that the porcupine can shoot his quilts by switching his tait?—Y G., Jr., St.

A .- altractics in threabing his tail, the porcupine may loosen some of his 30,000 odd quals, he cannot shoot them at will nor aits them. He main method of defense is to protect his head and bristle his guills,

#### Sun Bends Buildings

Q .- cons the heat of the sun have any effeet on tall buildings?-F. H., Milwaukee, Wit.

A .- THE sun's effect on tall bushilings is graphically shown in the case of the Wash-ington Monament in Washington, D. C. The expansion of the shaft caused by the continual heat of the sun on the south side has made it shift as much as two and five eighths inches to the sorth.



#### Men's Memories Vs. Women's

E. R. T., orsever, rote. According to a recent test, a woman tends to remember the pleasant experiences in her life and forget the unpleasant ones, while a man generally remembers the unpleasant moments, forgetting the pleasant ones

#### Fastest-Growing Tree

Q.—warat species of tree holds the record for growing speed?—P. A., York, Pa. A.—rrat balsa tree is the fastest-growing

tree known. Although its seed is little larger than a pinhead, the tree often sprouts to a height of seventy-five feet and diameter of twenty-five inches in five years.

#### Stratosphere Hot

Q.—what is the temperature of the stratusphere one hundred miles above the sarth?

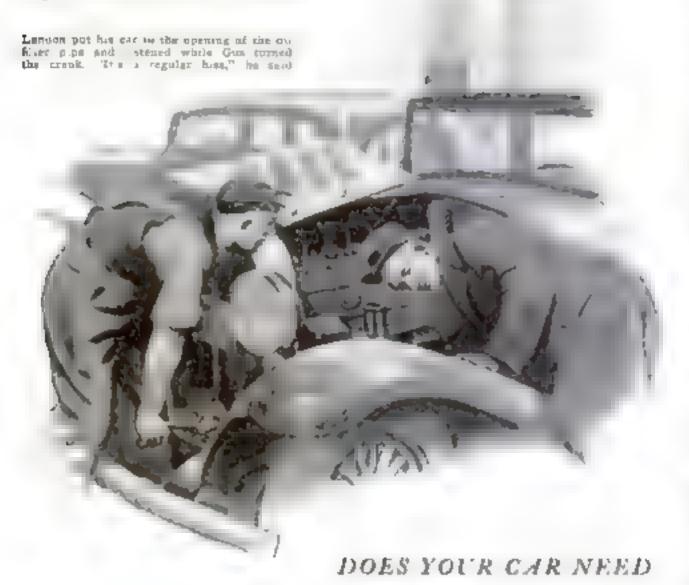
—J C. K., Boston, Mass

A .- CONTRARY to popular belief, a Naval Research Laboratory report states that the hand of stratosphere between sixty-two and 124 miles above sea level is at a constant summer temperature of about eighty-six degrees Fahrenheit regardless of day, night, or

#### Tornado's Measurements

D. F. G., at Louis, Mo. On the average, a tornado's path is thirty miles long and 1,000 feet wide. In most cases, it travels forward at a speed of from (Continued on page 120)

### By MARTIN BUNN



# New Piston Rings?

F TILLRE'S anything that gets my goat." grumbled Gus Wilson, "It's the fellow

who's always thinking there's something

wrong with his car "

"Well, then, you'd better hide your goat," granned Jue Clark. "Here comes the world's worst " Gas looked up just in time to see Ted Landon's car roll into the Model Garage driveway

"Got time to check my anti-freeze,

Gos?" the driver called.

"Sure thing," replied Gus. "Run her nside."

"And while you're at it," suggested Landon, "you might check the buttery and kind of look things over Seems to me she sturts a little hard, these cold

morn ngs. ' As Gus worked. Lancon wandered around the shop inspecting the assortment of tools and parts, "Do all cars have cast .ron pistons?" he asked, fingering one of

the pistons on Gus's beach. "Not by a long shot" replied the mechante, "Aluminum-alloy pistons are just as popular. Then there are nickel-iron, egst-iron, and semi-steel pistons."

"Why so many different kinds? One type must be best."
"It's differences of opinion that make the world go 'round," report Gus with a grin. "Each type has its good points and to argue their pres and cons is worse than a row over religion. Why the sudden interest in pistons?"

Oh nothing," the customer replied. Only I've been thinking maybe I ought to treat this bus of mine to a new set of fitstons and rings.

What gave you that happy thought?" asked tous rooking up from his work with

The car's ready for them," Landon replied. "She's gone over fifteen thousand miles and seems to smoke more this win-

ter than she used to."

' Smoke ' repeated Gus.

"Yeah, especially when I first start her up. Sort of whitish and it puffs out of the

exhaust in regular clouds."

"Plenty of brand new cars do that in cold weather," replied Gus with a chuckle "That's just the cold air condensing the moisture and unburned gasoline. If that's all you've got on your mind, you can stop worrying.

But that usn't all," Landon insisted. "She smokes sometimes going down hills."

"Some cars do that too. When the wheels work against the engine, the pumping of the pistons tends to push oil up into the cylinders. Naturally, as soon as you speed her up again, the oil is burned. You don't use much oil, do you?"

"About a quart in seven hundred miles,"

said Landon.

Nothing so startling about that," Gusassured him. "Your car's s a little older than it used to be. The bearings aren't so tight, and the moving parts are a little worn. Naturally, you're going to use more oil. You don't know what it is to feed an honest-to-goodness oil-pumper " "Well, just what are the symp-

toms of worn piston rings?" Without answering, Gua put down his tools and walked over to a group of cars parked at the rear of his shop, "Here's a first-class example," he said, pausing in front of a three-year-old sedan. "First of all, she cats a quart of oil every handred miles and to trail her is lake following a freight train through a tunnel.

"On top of that," Gus continued as he fished a crunk out of the tool compartment and pushed it into the hole under the radiator, "she ham't any compression. Here, turn this crank and you'll see what I

"Does turn sort of easy," Landon agreed, as he wound the cenak

"Right. New try cranking your

OWD Cat "

This time Landon found the job a little more difficult. The crank seemed to regult from at regular to tervals, "Got more spring to it, be reported.

"That's it. The rings are tight enough to hold compression," explaned Gus. "Why, the rings on this other crute are so loose you can bear the pressure leak by

Landon looked at him brank.y. "You can hear it?" he said doubt-

fally

Sure Pull the cap off that oil fider pipe and park your ear close to the opening while I turn the crank."

As Gus cranked Landon has tened. A paeased gun apread over his face "Well, 131 be damed,"

be exclaimed. "It's a regular him like gan

Gus nodded. "On some cars it's so bad you can bear it even when the motor's running. In any case, that's a blamed good sign of blow-by caused by lenky poston rines."

"How about the spark place?" (nquired Landon, as he slipped the oil filler can back into place, "Don't bum rings foul

the points with ail?"

"Maybe yet and maybe no. It's a funmy thing about all these aigns of leaky piston rings—they don't always follow the rules. Had a car in here just the other day that had all the symptoms except one -high til con- (Continued on page 111)

### GUS says:

If your car ign't fitted with a cooling system thermostat you can climanate a lot of the cold-weather wear and tear on your motor by installing one. By stopping the water circulation until the motor warms up, it cuts down bearing wear, crankcase dilution, and gasoline bills by keeping your motor at summer temperature for most of your winter driving.

# THE HOME WORKSHOP

OLD TOY REBUILT INTO NEW



TREAMLINED trains are making history so why not add one to your model flus-trated was built to the scale of 1/4 in. ecuas I ft from drawings of the famous three-car Union Pacific train M-10,000 (see P S M Jan '35, p. 11).

No espensive materials are needed, and anyone, with time and a little patience

an construct a train of this type. As far as size and detail are concerned, it is a minutage edition of the real thing.

The total length of the model is 51 in. The long cars require a minimum radius of 48 in. for the curved track. This means that your toy track will have to be reand, or else the cars made shorter so they will take the usual toy curves. Shortening the cars will spoil the scale effect, but will not detract from the fun of building and operating the train.

The first thing to do is to obtain a sustable motor and the trucks because the rest of the train must be built around these. A regular "0" gauge toy locomotive motor will do. While the driving wheels are larger than they

#### The cars are of pine and pressboard with made-over trucks-Discarded locomotive motor provides power

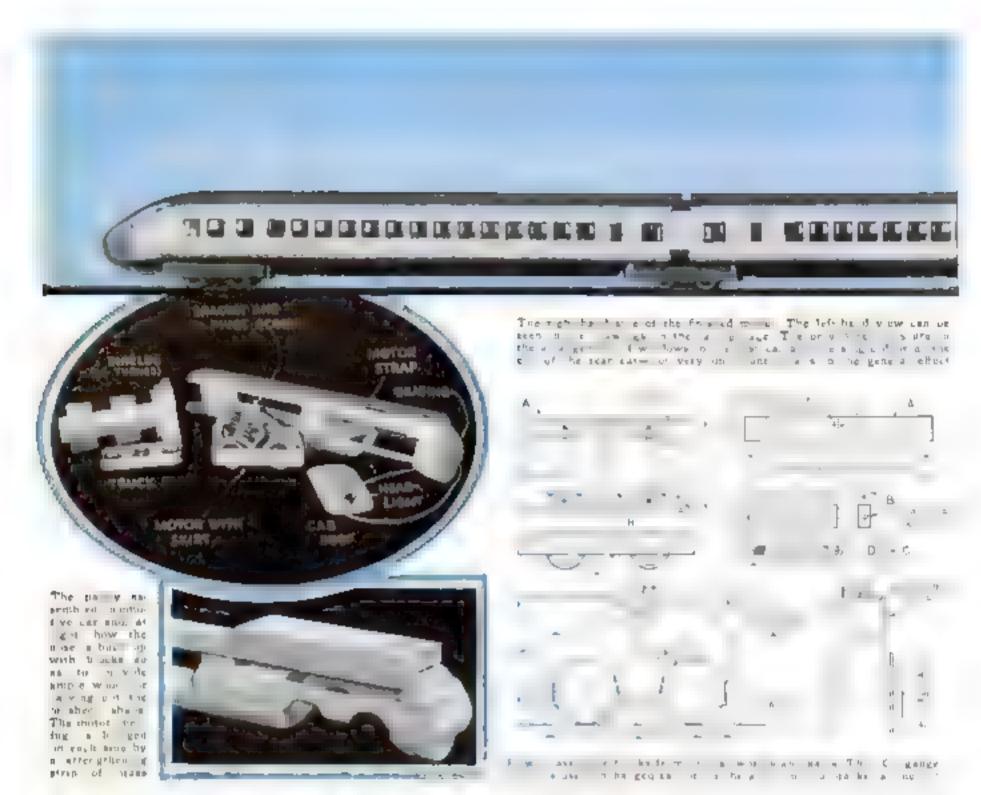
should be (15% instead of 3% in.), there is no harm in this as the wheels are concealed behind "skirts" and there is am-ple room in the focumotive car to swing the wheels when taking a curve. It is possible bowever to stasti ate wheels of the correct scale size by changing the wheel gears and adding two after gears between

the wheel gram and the intermediate gran, which is not disturbed.

In the author's model trucks such as are used on scale model freight cars were taken for the traners. The wheels of these are just the right size, 11/16 in. in diamtions were ground off the side frames to



Side view of the second and third cars before the pressboard sidepieces are added, and a bostom view of the same cars. A 32-16. Brass pivot sod passes through the wooden shield, hong bars, and track frame



make room for the skirts used in stream-I ning. These skirts are made of brass strip 1/16 by 34 by 4 in. They are held in place by 2-56 flathead machine acrews, which are tapped into the frame chatange

If trucks of this type are not available. others can be built up by using the wheels and asles from some old cars. How to do this is shown in drawings at right above.

Each of the three rear trucks carries a center third-rail contact shoe, primarily for the car lights. Thus is made from phosphor bronze strip and is attached by means of a piece of bakelite so it is insuated from the rest of the truck.

The method of equipping the mater with skirts is shown in one of the photographs. A small bracket and a screw are added at the top of the motor so it can be suspended and pivoted from the top of the locomotive car. In placing this bracket (and the strap from which it pivots), take care to see that it is at the right beight so the locamative roof will be at the correct distance above the rails.

Use only clear white mue for the body framework. The dimensions for building the cars can be found with the aid of the Vi-in. squares on the assembly drawings. The roof and floor are circular sec-

The first operation is to lay off all the car lengths and do the necessary boring for the shields (articulating pivota) before cutting apart. Use on expansion bit, If available and be careful that the bole is

tions, the dimensions of which are given in a separate detail drawing. These can be planed at home, or some woodworking plant will make them for you. Five feet of each section will be ample

The roof and floor lengths are not cut off square, but alone back from the center lines toward the sides so they appear slightly pointed when one looks down at them. This leaves a gap at the sides to enable the cars to turn when takog curves. This gap is closed by the turned wooden shield that serves as a pivot. As you have

ing points

already noted in the detail drawing of the roof and floor sections, they are of different widths, therefore the amount they must be cut back at the ends will be different on each to give the same angle. It is best to finish the roof bole

not bored all the way through the roof

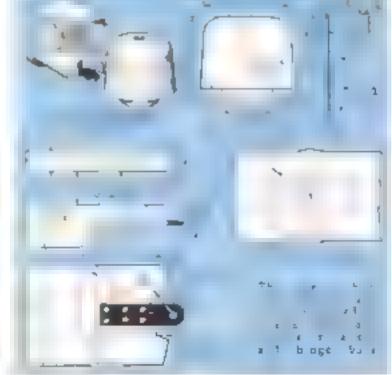
The locomative is 18 in, long, the middle

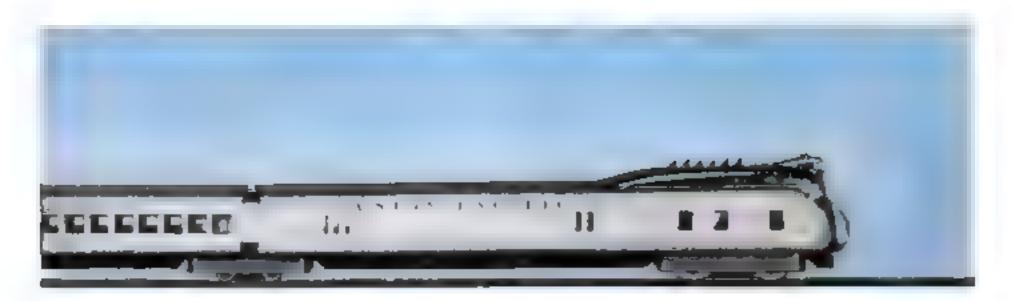
car 15 in., and the rear car 18 in. Mark

off the center lines carefully at the divid-

with a gouge and chisel, A 1/16in, wall should be left around the roof to cover up the shield. Use a fine-toothed saw for cutting the pieces apart so little will be wasted in the kerf

Next cut the recesses or clearance spaces on the underside of the floor pieces for the trucks. Do this at both ends of the middle car, at the back end of the front car, and at the front end of the rear car. The dimensions are given in a detail drawing, and the gen-





eral shape can be seen in the photographs. Also cut out a similar recess for the rear truck. The center of this is 14 in. from the center of the front end of the rear car.

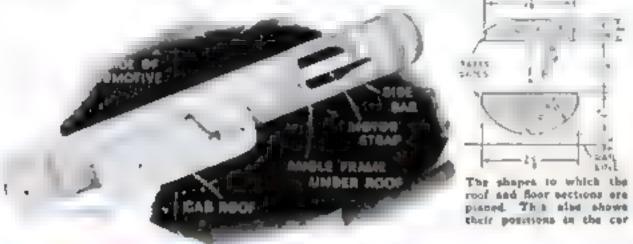
Make four hinge bars or plates as shown from brass, 1/16 by ½ by 2 in. Drill a 3/16-in, hole at one end for pavoting, and five or six small holes for the mounting screws. Mount these plates on the underside of the bottom in the clearance spaces formed for the trucks. The hange plate

on the rear end of each car is set in a recess or mortise 1/16 in, deep, but the one on the front end is mortised in 1/4 in deep. This permits the hinge plates to rest one above the other and to keep the cars level when joined. Be sure that these plates are properly confered or the cars will not pivot properly

The pivot shields, shown in the drawings at the bottom of the facing page, are turned on a lathe from hardwood to the dimensions shown. The top of the shield is rounded to fit the contour of the bore that has been bored and chiseled in the roof. No great accuracy is necessary; in fact, the shield should fit loosely in this hole and in the one in the floor so it will not bind. Drill a 3/16-m. bole through the center of the shield from top to hottom for the pivot rod. Counterbore the top suchily to form a recess for the nut that will hold the pivot rod. The pivot rod in 1/6 in in diameter and threaded at both ends. Solder a nut at the bottom end. Make two coliars from 3 16-in, outside diameter brass tubing to a length long enough to support the trucks at the proper distance from the shield.

These little collars serve also as sleeves for the hinges plates, that is they fit within the 3 to-m holes drilled in the ends of the hinge plates.

Assemble each car framework next. The bottom of the three cars is to be 1/2 in above the top of the rails, and the roof 3 in, above the rails, as shown at the left. The space be- (Continued on page 90)





The left-hand side of the train. The outline of the sidepletes is shown by the heavy line. A small red bending strip is nailed along this line

# Small Table Built in Modern Style

HIS small modern table for use in the aving room or library was constructed entirety of pine with black walnut inlays, but maple, birch, or any light colored hardwood will give an even more sausfactory and durable piece of furniture. The end shelves are for holding books.

The mortise-and-tenon joints, with the exception of the three front rails, are designed so that they can be made with the circular saw Grooves for the inlays can be made by the same method. Cut the inlay strips sught y wider than the grooves and bevel each edge soghtly so that it with be a grive fit, thus operating the necessity of clamping them when they are

The two ents of the framework are gland, clamped and allowed to dry Then assemble them with the front and back, and test with a steel square to be certain that the table is square. If necessary insert one or two temporary diagonal braces. within the frame and leave until dry,

gated in place

The shelf ends are glued in their respective martises and pinned with two 1/4-in hardwood pina. The drawer runners and bookshe ves can be built in next

Then make the drawers. The sides can he foined to the fronts by a simple rabbeted joint, but a doveraged joint is better

The top is glued up to the proper will h and a cut is made with the cir-mar saw about every 2 in, on the back. These cuts are about three fourths the thickness of the wood in depth, They counteract the tendency of the wood to warp. After the

edge strips are gloed in place fasten the top with four screws driven from the underside

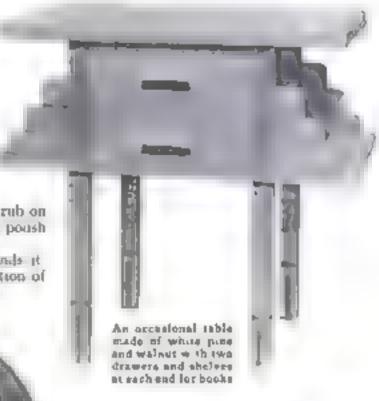
Shellac and wax make a satisfactory and serviceable finish. The shellac-either orange or white, depending on the colordesired—is applied in that coats each coat being allowed to dry for twenty-tour hours. Sand each coar with worn sandpaper

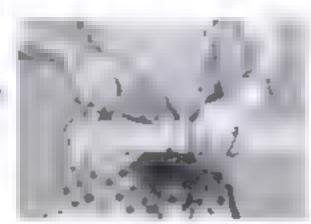
Apply three or four coats and then rub on a 19ht coat of any good wax, and poush with a soft cloth.

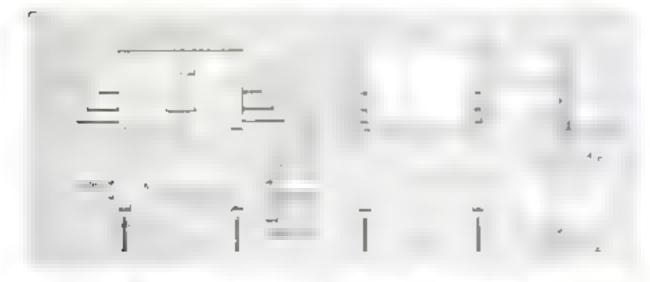
The design of this table also lends it self particularly well to the application of colored racquers. Rocen Moven.

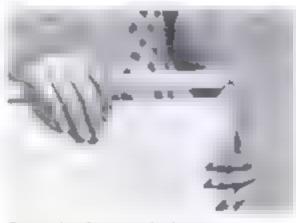


If the justs are well made, a woman can put the framework together-and actually did in this case white the author enapped the photos









Ser ps of welcut are glued in grooves cut in the segs and ower photo a new edging in metered and glued around the top of the table





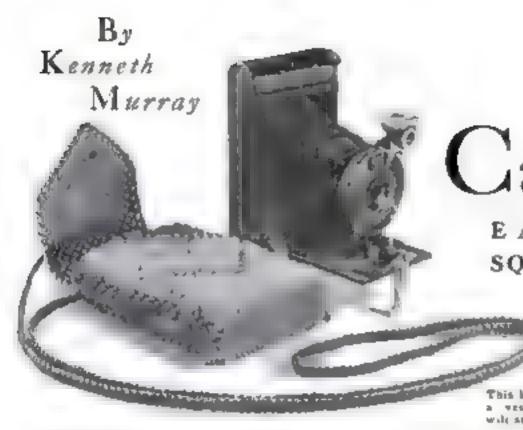
The shoe-shining suifit is periabea, cloths, brushes

#### LARD TUB HOLDS SHOE POLISHES

A STURBY shoe-shining stand can be constructed from a small wooden lard tub. Clean the tub thoroughly by scraping and a liberal application of cleaning solvent. With a saw, cut from between the bands about one-third the staves to form the drawer front. Next construct the drawer, usang the sawed-out stave sections for the front, These should be bound together, inside and out, at the top and bottom with strips of tin or brass fastroed with brass bolts or stove bolts. The original lid of the tub is replaced and nailed. With the tub inverted in its new position, the staves below the drawer front must be bolted to the band crossing them

A shoe form is next cut from a piece of soft pine, mounted on a block at an angle of 15 deg., and placed upon the small end of the tub. The currying handle is then teansferred to the small end. Sandpaper the bands and wood lightly, apply dark ook stam followed by a cost of clear varmsh, and

add a drawer knob.-H. A. CLAYTON



Durable Camera Case

EASILY MADE WITH SQUARE-KNOTTED CORDS

This hootwork case for a very pochet comme will stand endicas wear

HIS fine-looking and very duraale case for a vest-pocket camera is made merely by tying simple square knots in a number of
lengths of strong cord. Cameras of other
sizes can be accommodated by altering
he measurements. Regulation knotwork
cord, which can be had in many colors,
may be used, or strong fishline. If the case
is to be a gift for a woman, heavy silk
cable cord is appropriate

The case if ustrated was made in blue, with brown sides, carrying strap, and trimming. To start, cut a blue outline



1 The case in scenario at the potent of the Rap Aildst one' doubted contains the then tooped on the out' ne cords which are shown at each side, but I the Sap in the departer, width



2 How the strip is widered to provide the sides for the case, At right The extra cords added over the outline cord At fefr. The outline cord is tied in with half-hitches

cord 2 ft. long, and swenty-two blue working cords, each 12 ft. in length. In addition, you will need two glass pushings and the usual knotwork book (fastened at your waist to hold the filler cords).

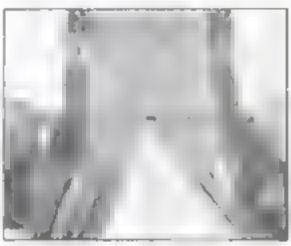
Find the middle of the outline cord (so called because it remains on the outside edge throughout) and, over it, double hop the middles of two working strands. This leaves four cords hanging down Secure the two on the inside in the book, and with the two on the outside make a square knot. Fasten the knot down to the table top with a pushpin and let the outside top with a pushpin and let the outside cord hang down on either side in the shape of an inverted "V." This forms the shape of the thap for the camera case

The method of adding more cords to the outline cord is shown clearly in Fig. 1. One is added on each aide for each row of square knots made across the flap. When all of the working cords have been added, proceed to knot a straight strip for thirty-live rows. (Continued on page 92)

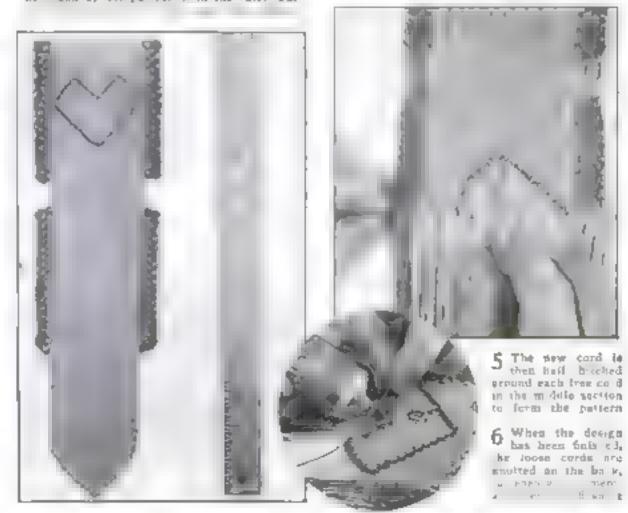
Before a shown the print when a lithe host tind has been completed. The dimensions can be found by compares on with the ruler but

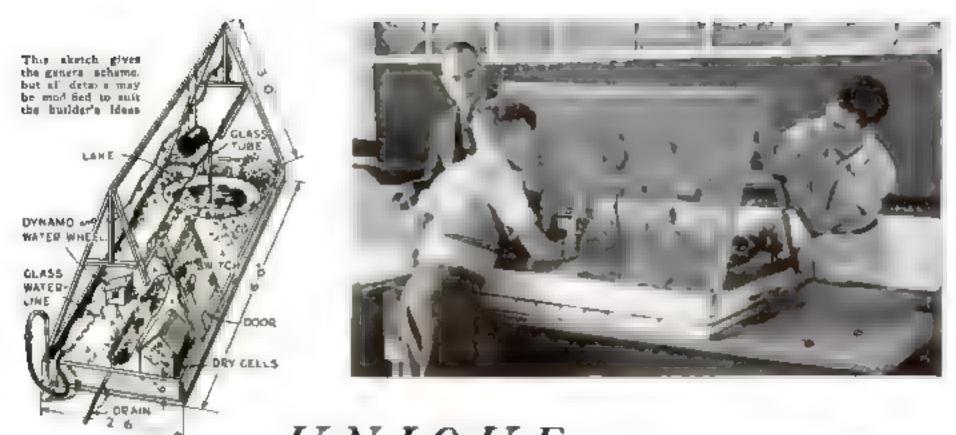


3 The right width to make the knotwork strip can be found by laying the comers over it Abas ate accuracy is not necessary as the finmbod citip can be stratched to a certa a cutant



To start the design for organisms ing the train of the rese. The cords are known in more and V and a known on did consequence on cords a train to the two module cords.





# Terrarium and Aquarium

#### HAS MAGICALLY FLOWING WATER SYSTEM



End view showing glass supply cube which is concealed by the falling stream of water

A COMBINED terration and aquatium, illuminated by a small lightang plant, can easily be made as shown in the accompanying illustrations. This one was constructed by the boys in the arience department of the Maxton (N C) public schools

A cement lake provides the aquarium, and the overflow of water operates a water wheel in a cement channel leading out from the lake. The lake as fed by a magic water system. A glass tube leads from a near-by faucet in the laboratory and comes up through the center of the lake into the suspended tank. The pressure forces the water through the glass labe into the vessel from which it overflows and tuns down over the side of the glass, thus concealing the tube.

The glass feed pipe is laid about 1 in under the suit from where it enters all the way across to the lake. Enough soil and plants are placed in the bottom of the lake to make it suitable for the growth of any smal, plant or animal. In fact, the entire

structure inside is built on a soil foundation about 5 in, deep, thus making it possible to grow plants of several species. The plants are inhabited by various living insects and small animals. One large dead plant is planted in the center, and to it many insects in the pupal stage are altached

The power and lighting system consists of a revolving water wheel, generating and power houses. No. 18 copper insulated wire, and five flash-light bulbs. Four of the light bulbs are soldered to the wire and suspended above the lake and canal. The fifth light is installed at the switch. Concealed dry cell batteries furnish power for the lights. This power, however, appears to come from the dynamo attached to the water wheel.

A Pelton water wheel is used. This was constructed by laying a ½-in, tube 12 in, long in the cement from the lake to the water wheel with a 3-in, drop. The tube ends in a nozzle near the wheel in order to throw the water with greater force. This arrangement makes it possible to operate the power system with a very small amount of water. The water needed to supply the necessary change in the lake is sufficient to operate the water wheel continuously

The entire system is screened in to prevent the escape of insects and some of the water animals.—Eanest D Hancock.

#### FLATTENING PHOTOS

Preserve dry glossy photographs are likely to crack if straightened out under a ruler in the usual manner. The possibility of cracks can be avoided, however, if the backs of the pictures are first gone over with a damp (not wet) sponge.

Prints scaked in a weak gylcerine solution before being ferrotyped will peel off the plates without curting or leaving drying marks.—C. L.

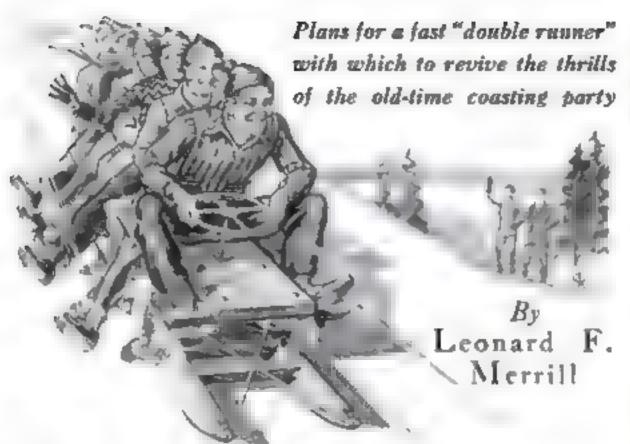
#### GUMMED STENCILS FOR SMALL DESIGNS

With stenciling small designs on finished woodwork, it is almost impossible, with the usual stiff stencils, to make the design tlear and sharp at its edges. It is better to make the stencils of lightweight paper that has been shellacked and then coated two or three times with clear ribber cement. They can then be pressed tightly against the wood and will remain until peeled off. The stencils may be used indefinitely

The rubber cement can be purchased in tubes or tims, or it may be made by adding raw rubber to benzoie. This, however, requires several days to become thoroughly distolved.—George S. Greene.



Stencil made of paper that has been shallacked and coated on the back with rubber cament



# Bobsled Building

big runner—call it what you will—provides fine winter sport and requires only a little snow, a bill, and a congenial crowd to give no end of thalls. There was a time when a pair of hand aleds suitable for use in assembling a hobsied could be bought, but that day is past, so it will be necessary for us to make our own sleds, as well as the rocker, turntable streening gear, and seat.

Materials Harowood—t pc. 1 by 4 in. by 14 ft., 1 pc. 1½ by 2 in by 7 ft., and 1 pc. 2 by 3 by 16 n. for sleas, 1 pc. 2 by 4 by 26 in. for turntable; 1 pc. 2 by 7 by 36 in. and 1 pc. 3 by 4 by 14 in. for rocker; 1 pc. 2 by 2½ by 20 in. for foot-

Spruce—1 pc. 11/2 by 12 in. by 11 ft. for seat.

One spool (either wood or metal) 3 in. long, 5 in. in diameter, with 34-in. bole for the shaft

A discarded auto steering wheel with piece of shaft 12 in. long.

Flat fron-18 in. of 1/16 by 2 in, for

turntable brace and steering-gear support.
Round from—20 ft. of 35-in, round from for braces and runners.

Two pulleys 36 by 1 in. (with screw even) for steering tear.

eyes) for steering year.

Manula rope—8 ft. of ½-fn.

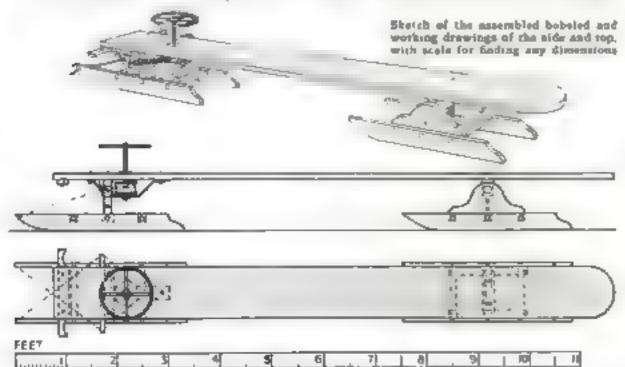
Fiathead fron screws, 24 of 1-m.

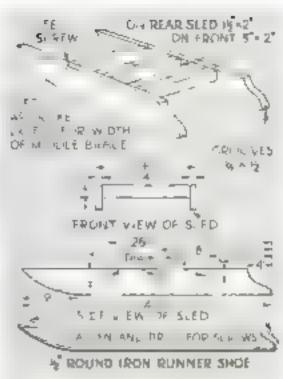
Carriage bolts: 6-2½ x ¼, 2-3 x ¼; 4-3½ x ½; 4-4 x ½; 2-6 x ½; 1-10 x , Flat tron washers for all bolts.

If running boards are to be added: 2 boards 4, by 35, in by 10 ft, 8 ft of 1/2-in, round from, bolts for the braces and boards.

Tools. Usual woodworking tools and back saw, drill, countersink, center punch, machinist's hammer, and an anvil or suitable substitute.

Method. The two sleds are made first. They are alike except for the middle brace of the front sled, which is twice as wide as the other two braces. Lay out and cut one runner on 1 by 4 in board. Use this as a pattern for cutting three more. Bore 1-m. boles for ends of wooden braces, specing centers 1 in below top of runner and 40, 18 and 26 in from rear end.





Now the sieds are constructed. Note that the front sied has a middle brace 3 is, wide

To insure uniformity, clamp two runners together and bore holes at same time

Cut five wooden braces from 1½ by 2 in, by 7 ft, piece. If lathe is at hand, cut each 16 in, long and turn 1 in, on each end down to 1 in, in diameter; otherwise cut 14 in, long, bore a 1-in hole in each end about 1½ in, deep, and use a hardwood dowel. In the latter case, both ends of the dowel will have to be held in place with a screw. If the ends have been turned, only one screw is needed through the runner into the brace. The middle brace on the front pled is similar, but 3 in, wide.

Lay out the turntable as shown, being sure all measurements are full. The lower half is bolted to middle brace of front sled with two 3½ by 36 in, bolts. Find the exact center of this half of the turntable and bore a ½-in, hole through it and the brace to receive the lower end of the 10 in, bolt

For the rear aled, lay out two rocker supports on the 2 by 7 in. piece. Locate center of hole before cutting. When both supports are cut, clamp them together and bure boles for the rocker journat. This journal must be either turned down on a lathe or else carefully worked down with a chisel. It is not in the exact center of the 3 by 4 in, crosspiece, but 35 in below center horizontally and on center vertically. The fit should not be loose, neither should it bind. Four 4 by 📲 in, bolts fasten the rocker supports to the sled. Clamp the supports to the braces to prevent alipping, and bore boles through both at once.

Remove turntable, rockers, and cross braces from runners. Drill and countersink a hole for a 1-in screw from the top of the runners into each cross-brace hole. Turn runners upside down and cut a groove 1/2 in, wide and 1/4 in, deep the full length of the bottom. Heat the end of 2 15 in round from rod and flatten for 2 in. At this end also curve the rod to fit end of runner. Continue curve around entire toe of runner and along bottom. When beel is reached, allow about 2 in. and cut off. Heat the beel end, flatten, and bend to fit sround heel of runner. Drill and countersink two holes in each flattened end of iron. Repeat this operation for each runner, then proceed with the general assembly. The iron runners, however, are not (Continued on page 104)

# PRESSING A RUBBER BULB PROPELS THIS INGENIOUS

# Toy Submarine



THIS amoung little submarine can be operated in an ordinary tub or a hathtub full of water. It will move forward on the surface, submerge, travel under the water, and rise again.

The bull is made from a small tin can about 2 in, in diameter and 3 in, long with both ends removed. If such a can a not obtainable, you can make one from the tin of a larger can.

The cone-shaped ends, the coming tower, and the periscope are made as shown. The small tin tuber are formed around a half of the proper size. The not is then removed and the seam soldered. The 4-oxlead weight is suspended 1 in, below the half, otherwise the boat will be unstable.

The rubber taking should be as small and light as possible (about 1/6 in. outside diameter) and 3 or 4 ft. long Tubing such as that used on trick roses as very good. Novelty stores usually have them for sale. If one tube is too short, join two of them together. The bulb that is ordinarily attached to the tubes is rather small, but it may be used if a bole is cut in it. A bulb from an atomizer is better. The valve should be removed and the tubing attached as shown. Other details of construction are made clear in the drawings be on.

The tube on the submarine to which the

rubber tubing is connected extends to the top of the hull, and the only other opening into the boat is the propulsion to be Thus, to submerge, air is drawn out by means of the bulb and water enters through the propulsion tube at the stern. The vessel will settle lower and lower until finally the periscope goes under. If you wish you may submerge until only the top of the periscope is in view

through a propulsion tube moves the "sub" forward, de lefer Diving under a wooden "ice doe"

To bring the submarine to the surface again, simply pump air in by squeezing the bulb while the thumb is held over its open end. Then, before releasing the bulb, remove the thumb, and before squeezing it again, replace the thumb. When drawing air out, the operation is reversed

To propel the submarine forward on the surface, set the rudder as desired. Next compress the bulb and draw air out of the boat until the deck is awash. Then press the bulb steadily. As water is forced out of the stern tube, the boat will rise and move forward at a fair rate of speed. Keep your thumb on the bulb opening and allow the bulb to expand, then repeat the operation.

The most interesting trick is to propel the boat forward without rising to the surface. In order to do this, submerge until resting on the bottom. Then force are into the boat until it just starts to rise

and move forward, but release the pressure before it has had true to sue to the surface. Allow the boat to siek, and repeat the operation,

Paint some wooden blocks white as shown in one of the illustrations, to represent an ice floc and you can have a lot of fun trying to pass under the floe without humping the periscope If you come to a patch of open water, pump air in very slowly to bring the submarine straight up. Patt R. Ranne.



#### HOW TO REPAIR BROKEN DRESSING-SET COMBS

Valuable combs and other articles in a matched dressing set can often be repaired, when broken, by using two short brass escutcheon pins, brads, or pieces of wire as dowels. Two boles are first drilled in one part of the comb. Short metallic points are inserted temporarily so that when the two parts are brought together marks will be made in the undrilled portion as guides for drilling the other holes. Cut the heads from two short brass brads and use them as dowels. Place a little transparent cellulose rement on both the dowels and the broken edges, and force the parts tightly together. The cenient should be allowed to dry undisturbed for several days.—E. A. Bowks

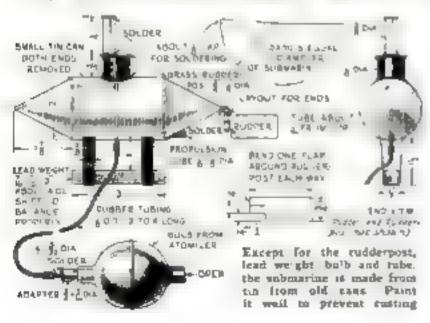


Holes are drilled in the parts, which are then assembled with brase puts and coment

## OFFICE STAPLER TACKS LABELS ON WOOD

An ordenary office stapler, when removed from its base, may be used for quickly fastening address tags to wooden crates or boxes and also for tacking up balls or notices. The wire staples are easily forced into the wood and hold the paper or cardboard securely.—Emil. Pearson







NLY a lathe is needed to ornament

segments of moldings glaed around the

hase are cut from turned rings resembling

ares of 3-in, radius on a piece of plywood.

If a bancsaw is at hand, and several travs are to be made, tack a dozen or more thicknesses of three-ply together with the

pattern on top (nails driven into the waste

wood), and cut the batch at one time,

Sand the faces smooth, sponge with water to raise the grain, and sand smooth again

For a ready fine paint job, brush on

two coats of lacquer, and when dry,

scrape level with a square-edged cabinet

scraper, finishing with split 6-0 sandpaper

used wet. Then give one more coat of

color, to be rubbed down, first with the

sandpaper, then with pumice stone and

While the bottom dries make the mold-

ings. Mount disks of wood on a face-

plate for turning the fronts. It is necessary, of course, to be accurate in turning

water applied with a feit pad

For the bottom scribe an 11-in circle. draw eight equicisant radio, and strike

round picture frames.

when dry

the edges of this colorful tray. The

Never Say a Job's Too Hard

Suppose you wanted a tray like thus, but did not have a spindle shaper for making the molded edge. Would you give it up? The author of this article didn't. He simply used his lathe for turning the moidings.

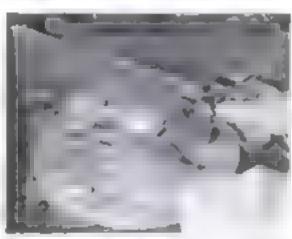
> Use the chuck, with the asldition of guide blocks, as a miter box to cut the segments. Insert the half-rings with the rabbet out and the grass running the long way.

Scrape the paint from the bottom along the edges, exposing 1/16 m. of wood. If thick casein glue is used, the sections can

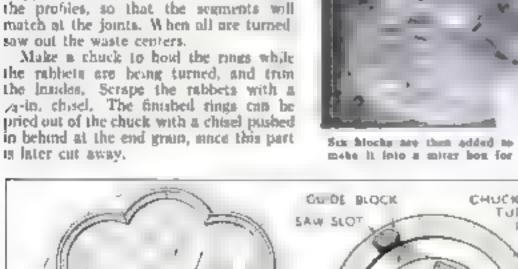
be pressed in place, and no nailing or clamping will be required. Complete the tray by pointing the molding as desired

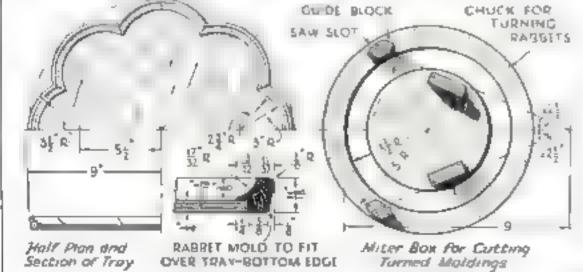


The rings are held in a wooden chuck for turning the rabbet and trimming the muide



Six blocks are then added to the chuck to make it into a mirer box for the moldings







#### CORD FOR CRAFTWORK DYED WITH SPONGE

WHEN lengths of cord are to be dyed for ship model making or any form of craftwork, dip one side or end of a sponge in the liquid and draw the cord through this portion by means of a needle. It should pass out through the dry part of the sponge, which will remove all surplus coloring matter. This is a next, clean method and is particularly useful in dyeing cord for square-knot work, and for coloring of applying a protective liquid to fishing lines.--Wellington Link

#### TINSEL FUSE PROTECTS MODEL RAILROAD

ALL model rankups should have their electric current supply systems protected either by a circuit breaker or by a fuse. Circuit breakers, however, cost money, and if the model railway is much used, even the expense of replacing plug fuser becomes quite an item. The illustration shows how to construct a fuse for model railways, that, once installed, can be renewed at virtually no expense

First connect in the circuit a grid leak clip such as can be obtained at any radio store. Also get a grid leak of the tubular type with metal ends. Any radio service man is likely to have plenty of discarded ones in his scrap box. Remove both metaend caps by applying a little heat, as these are usually fastened with a shellac-like cement. Take a strip of Christman-tree tinsel or tinfoil a bit longer than the tube portion of the grid leak and put it in so that the ends will be held in place by the end caps. The pressure will insure a good contact. If the fore blows too easily, fit two pieces of tinsel or a thicker strip of unfoil.-Walter Flint, Ju.



The fuse is a strip of tipfoil inserted in an old radio grid leak of the tubular type

# Check Your Shop Lighting

HEN you tackle a job in your home workshop, do you make frequent mustakes, bruise and cut your fingers, and emerge in an hour or two with a hendache? If you do any or all of these things, the chances are that there is something wrong with the shop lighting system.

thing wrong with the shop lighting system.
"Oh, I doubt that," you may say to
yourself, "Besides, I have a big built right
over my beach, and the shop looks to be

pretty well lighted."

All right, test the light for yourself and see just how good it is. If it is nighttime, stop reading right away and take this magazine to the basement, or wherever you have your shop. Lay it open on your beach so that the chart on the opposite page is in the position where you do most

of your work. This chart has been especially worked out by Publican Science Monthly to serve as a test of home work

shop illumination.

Now lean over until your head is at your normal reading distance from the chart and try to read the smallest type—that in the upper right-hand corner. Then look at the small drawing directly at the left of the type. Can you make out all the lines, distinguish the separate parts and read the dimensions and identifying letters?

If you can do all this correctly and easily, without any special straining, your bench is very we lighted at this particular point. There may be other things wrong with the lighting, such as glare, the casting of violent shadows, and the lack of proper reflectors and shades, but the

amount of light certainly is sufficient. If you don't have much luck with the first sample on the test chart, try the second. Study both the drawing and the accompanying type. If both are easily read the illumination at this point of

Try the third division of the chart of can be read comfortably in what may be called "fair" illumination, but this is no good enough for a workbench, especially

bench in good

when accurate or delicate work has to be done, such as fitting furniture joints or making models. Neither is it adequate for working from small drawings of the typpublished in magazines and books or for studying blueprints that contain fine lines and intricate details.

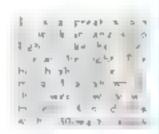
Many bome workshops do not have even this degree of illumination. If you find that you have to go as far as the fourth test specimen to make out the letters and figures quickly and clearly, there is no question about the inadequacy of the illumination. It is poor. In fairness to yourself, you should do no further work at the beach until you have improved the

You may me the chart in the same way at your machines, if you have any, or in other positions in the shop. Provided you are conscientious in using it, the chart will give a rough-and-ready but satisfactory check. For a more accurate and scientific test, lighting engineers use a sensitive instrument known as a "right meter," Your own lighting company will probably be glad to send a representative to your home with one of these meters to test all your lighting facilities, if you wash.

Plenty of light, properly distributed, is the best insurance against accidents, bungled work, and damage to eyesight in the bone workshop, according to J. M. Smith, a Cleveland illuminating engineer

Most workshops are underlighted, particularly those in which dark-colored tools and materials are used Engineers measure lighting intensity in foot candles. In too many shops, the value of the light on a workbench top is scarcely more than 1 or 2 foot-candles, whereas the recommended minimum is 15. Outside sunlight reaches values of many thousand foot-candles, so that you need have no fear of getting too much light. The new so-called "science scaing," what he lighting and vision extents have developed within the past few years, has revealed that it is practically and the lighting and too be ght-





You Will Do Better Work

. . . Save Yourself from
Eyestrain...and Reduce
the Risk of Accidents



# with New Test Chart

and that increasing the amount of light actually prevents the eyes from becoming tired as rapidly as with lower intensities

Even worse than too little light is glaring light. A 10-watt bulb, unshaded and suspended in front of the face where its rays shine directly into the eyes, can be poinful and will cause partial blandness no matter how much other illumination is present. Glare, then, is to be guarded against. In fact, it is the principal hughest of modern lighting systems, and sometimes is difficult to channate. In addition to direct glare from a lamp, reflected glare from polished metal surfaces must be avoided.

Shadows, too, have to be taken into consideration. In some types of shop work they are necessary to reveal objects in three dimensions, but when most of the work is concerned with length and breadth only, shadowless lighting is preferable. When shadows are desirable, they should be soft and luminous.

"How can I meet all these conditions?"
you ask, perhaps thinking it next to impossible to do so.

Take a concrete example: Suppose that you have a workbench 3 ft. high and measuring 3 by 8 ft. on top, and that the room has a teiling 7 ft. above the floor. This is a good average for basement shop conditions. You desire to light the beach in the most approved manner

A sufficient amount of light, Smith cal-



This thart will show whether you have excellent, good, fair, or poor light in your shop



You will find the pleasure to work with abop machines that are equipped with their own lights in surable reflectors. The milling machine above but an adjustable unit growing \$1.50 for the parts. It is adaptable to most machines, In the eval is a \$50-watt lamp mounted on a swinging arm for illuminating laths work properly

culated when the problem was presented to ham, will be provided by two 150-watt, frosted-bowl lamps in standard 14-in, R. L.M. domes, spaced 5 ft. apart and 2)/s to 3 ft. above the surface of the bench R.L.M. is a trade designation for the type of dome illustrated, although what it reslity stands for is "recommended by lamp manufacturers." These lighting units should be placed so that their centers are 6 in back of a vertical line extending from the front edge of the bench, and 2/2 ft, on either side of a line drawn across the center of the bench. They measure about 1 ft. high over all.

The R.L.M. domes are metal reflectors enameled green on the outside and white uside. They are scientifically shaped for the most efficient distribution of light. The porcelain, which is baked on, is easy to clean; and it and the bulb should be kept clean at all times if you want the most light for your money, R.L.M. reflectors are made (Commuted on page 95)

# OUR NEW Privateer Model



R model of the Swallow, a privateer of 1812, is now ready for the rigging. We have described the making of the buil, deck fittings, and spore for this smart little topicall schoooer in three previous articles.

This type of vessel was the fastest craft affect at that time. Though very loftily aparted, they were small vessels, so the spars and cordage were lighter than that of a full-rigged ship. This should be kept in trind

As with a real vessel, the first thing to be shipped is the bowsprit. The heel goes through the bulwarks, and the square end is set between the posts on deck. Pass the gammoning (lashing) around the 'sprit and through the hole in the stem about five turns, with cross turns between the 'sprit and the stem.

As there is no bobstay, the bowsprit shrouds come low on the ball (see the rigging plan published last month). The after ends are spliced or selsed to boits in the ball. Deadeyes are turned into the outer ends, connecting with others fastened to the howsprit at the after ends

Four thicknesses of cord are required as indicated in the accompanying list, although this may be reduced to three sizes by cutting out the size marked 'c' For sail gear and seimags, use "A" newing silk. Black cord will be required for standing rigging, and white or light brown for running rigging—that is, ropes which reeve through blocks. Where splices are

mentioned you can actually space the thicker grades or sente the ends back (a setting is a binding). With the thinner grades, a hitch is sufficient, as a rule,

To set up the riging, deadeyes are used as shown in a detail drawing near the end of this article. Chain plates made like No. 1 are the most correct; No. 3 is the simplest, and No. 3 is the simplest, and No. 3 is the kind I used as a compromise. It is formed of one ring around the deadeye, squeezed together underneath to be in the notch in the channel. The botton link is a link from a piece of chain, also squeezed together. The middle link is a piece of wire rove through both and soldered. The deadeyes must lie song on the channels. A small escutcheon pan holds the lower end down.

Now ship the foremast, being careful that it is in line with the stem and at the right rake aft. For the shrouds take a piece of cord, seize a deadeye in one end, pass the other between the crosstrees, around the lowermast and down again on the starboard side, and seize in another deadeye. Put knots in the ends of pieces of c-rord, pass the ends through the hole in the top deadeyes (facing the left eye

when looking outboard), through the corresponding lower deadeys, and so on. Haul them down tight together, but do not fasten. Do the same on the port side. When all four are tight with the most upright and the deadeyer are at the same level, hitch the ends around the shroud above the deadeyer.

As there are three shrouds to a side, pass the last one up one side and down the other; or, better, make a cut spice and pass that over the masthead.

Do the same at the main, but use only one pair each side

The forestay goes over the forward crosstrees, around the lowermast, and down the other side. The ends go through the bees and are seized tightly to betts in the hull, close to the bowsprit. If you are showing the hanks (rings) for the foresail, these go on before reeving through the bees. The two parts are seized together above the jib boom and at the top.

The mainstay is spliced around the lowermast head, close under the cap and is seased back to the eye in the forecap. The preventer stays go around the must-bead as for the fore, but in the ends are

spliced 3/16-in, blocks connected with similar blocks strapped to bolts in the deck at the waterways. When the foresall is set, the lee preventer stay is slacked up.

The rationes (steps) are of fine sewing silk, a full 1/4 in. apart, clove-hatched to each shroud. I use a bent needle for this, working from left to right.

Bessen shipping the booms, pass a knotted cord through

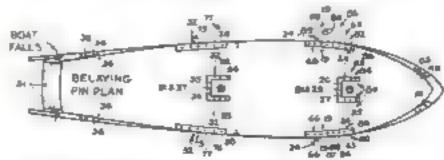


Diagram showing what the belaying pine are used for Rack number represents a line on the casin regging plan published last month

one end of the jaws, splice in the topping lifts, and seize on the sheet blocks. The seizings pass through the alots in the cleans. Double 3, 16-in. blocks are used for the upper, and single for the lower Put the jaws to the masts, pass the ends of the cords through the other holes in the jaws, and knot them. Reeve the topping lifts through blocks scized under the trestletrees and space blocks in their ends; through these reeve thin cords, one end of which goes to the bolts in the channels and the other through the outer sheaves in the fife-rail posts.

The fore-sheet block hooks to the ring on the traveler and hitches around its own parts. The man shee, hooks to the ring in the tattran, each end belaying to R cleat in the knees at the corners.

The foregast has a double block at the hws and another to the eve on the mast. The tackle of b-cord reeves through these and down through the inner sheave in the fife rail, to port. The peak halyard starts at the end of the gaff, through a double block at the manhead, through a block balfway out, then up, and down to the fife rail to starboard.

The main is the same except that the peak balyards have two blocks on both gall and mast, and the sides are reversed. Both have vangs to steady them from swinging. These are spliced or sessed around the gaff and lead with a single bigck and runner to bolts in the waterways. Throat downhauls are needed to keep them in position—from Jaws to fife rails. They should each have peak down-

haula also.

The jib boom reeves through the cap and has its heel lashed on the cleat on the bowsprit. The martingale boom, commonly called the dolphin striker, books to an eye under the cap, has an eye on either side for stays to reeve through and a shoulder at the end. For the martingale and backropes to hold it in position, splice a single cord (a) into the highs of another cord (b), with the eye of the latter just big enough to go on the end of the dolphin striker. Put this on, take the single cord and seize it around the end of the jib boom very tightly, then draw each leg of the backropes back to eyes in the bull and sense, or, better. make eyes in their ends and tachten with lanyards,

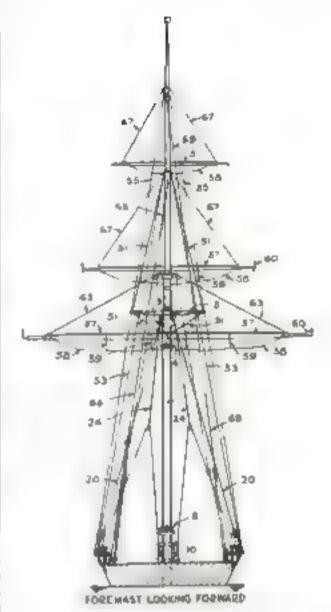
### Materials for Rigging and Finishing

Corp. 15 fr black about as shick as 20gauge R. & ~) wire and designated throughout as sure a 0 of black of gauge marked b 10 ft black and 15 ft o-gauge marked c and while the easier marked dies desired. With a name of the ased for both a and distribute to the magnetic wife for foot ropes distribute to the same of th sia siete. If No ill copper for chain places, provail traveler ex-City V 6 in with from all to 13 links per each or rables 3 in with a or lener ones per meh for topand hary ards. Blocks a lein is angle I double des cena ed as size 1 5 s in 5 seners 6 double size 8 g in 35 single 3 double size b 3 5 in 3 single size of gun as kinst 1 5 ser buck, marked b Dell'acya, 36 in Dell'acts 3, in. Districts and 4 of , 10 I nivo 4 px 1 3' in manje diameter and 4 in song for cable pipes and PHIP (P Pa . 60 common plas 1, on long or making eyebo a pad additional or na ng and other uses 20 No. a escutcheon gins tie chain pairs and rudder And there is no how many attacks of any long, had a data done tood Bank white and red he milekanku come brewn stain, varnob, good brads,

The ring for the jib stay must go on the boom before the martingale. This la a ring to slide on the jib boom, with a smaller ring soldered above it. The pib stay splices around the masthead, reeves through the little ring just mentioned, through a bole in the jib boom, and has n tister block turned into its end. This is connected with a single block booked to an eye in the cap (underneath), the end coming anhoard to one of the forward be aying pins. This may be omitted and the stay lead without the ring through the jib boom and through an eye in the martingale boom.

The fore-topmant may go on next. Don t forget the fid, or piece of wire through the heel to prevent its slipping down. Here the stays go on first, splicing around the mastheads and leading through holes in the jib boom, through eyes on the dulphou striker, and back to bolts in the hull where the ends are seized back

Next, the topmust shrouds, one pair



Supplementary rigging diagram, numbered to correspond with the plans proviously given

each sade, are sessed to the masthead. They lead through holes in the ends of the crosstrees and are sessed to the eyes in the furtock-shroud bands. These should have ruthines.

The topmast and topgallan, backatays come down as the lower shrouds to their reviewive dradeyes—5 32 m for the opmas, and a m. for the topgs and backstays,

The main topmast is similar except that there is a long topmast, no topgaliant. mast and only one shroud and one backmay on side. If you are using hoops, there must be some on this mast for the gaft topsail. The stay goes from the masthead o a boit abalt the main cap.

The lower yard is suspended with a sing and held to be mast with a truss. The former is a long strap with a buil seve seized in the oight. This is then passed around the mast and through the the other butht to he close above the yard. An eye as sented in the bight of another cord with a long end to go over the cap. It is passed through an eye spliced in the short end and seized. The hight of this and the bull s-eye are drawn together with a lanyard so that the yard ares immediately below the futtock band when drawn to the mast with the trust. This is of a-cord with a short end having an eye and a long end that goes around the yard and mast. The end leads on deck to draw the yard close to the mast or slack it as required. These fittings may be much simplified if desired.

At the yardarms the brace pennants are spliced on first, then the topsail-sheet blocks if any, then the topping lifts, A neater alternative is to splice the sheet blocks into the lifts. The forebraces have long pennants (Continued on page 96)



Stern view showing the jelly boot and the type of base used by Captain McCann. The model is not un minustane graving-dock blocks and in shored on each aids to take strain off keel

### ELECTRIC BANJO CLOCK BUILT AT LOW COST

ITH a few tools and ordinary skill, anyone can make a beautiful electric banjo clock. A suitable movement rany be purchased or, as in my own case, removed from a small, mespensive bedroom electric clock.

The dimensions of the wooden parts, as given on the drawings, are those I used but you may make your clock larger or smaller A slightly larger dial would be desirable, if one could be obtained.

After the various units have been made as shown, fasten C to D with small brads, then fasten C and D to B by means of a screw and a couple of brads. Have the back of the box and the clock container absolutely flush. Fit E inside the lower end of D and fasten it with fine brads. Through this sink two screws

through the top of F. Also carve the lower ornament 6 and fasten it to F from the inside At this stage both D and P are open in front Inside these two boxes, glue some narrow strips at the sides, top, and hottom, about 3, 16 in. from the edge. Find some suitable colored pictures to fit these open spaces. Back the pictures with cardboard, cut them to shape, and lay them on top of the strips. Cut glass to make a covering for the pictures, making the glass just small enough to fit inside the box and over the pictures. Glue narrow strips of molding around the edges for a frame, mitering the corners carefully.

Now attach A and fasten a small gold eagle to it. One can be ordered at any jewelry store but I carved mine from wood and at-

STOCK STOCK

How the nd vidua wooden units are made Gians covered pictures concent the front of the parts marked D and F

tached the outspread wings firmly with pms.

Use a plastic wood composition to fill in all the crevices, and sandpaper the case well. Apply a cost of walnut varnish stain, sandpaper it, and repeat three or four times, or use any other type of finish you prefer. Give the eagle a cost of bronze or gilt. Now fit the movement and bring the electric cord out through the back of the clock

I strewed an eyelet into the back in order to suspend the clock, and also placed two rubber knobs at the back in each lower corner so that the cord could pass down in back. If it is desired to place a scroll on each side of D, they can be easily cut from this brass. I put them on but later removed them, as I liked the general appearance of the clock better without —John Nen. Tirrany





LeVern T Ryder (et left), president of the Guild, presents a manuature gavel to the president of the American Hardware Manufacturers Association, Right, Shop of Charles L. Hitt

### The National Homeworkshop Guild Sets New Goal for its Great Leisure-Time Program

HEREdoysustand in relation to the National Homeworkshop Guild? Are you a member of one of its 128 affinited cubs? Has a Guid Club been organized in your town?

You awe it to yourself to answer these questions at once. If you have any interest at all in the home workshop hobby—and you must, or you wouldn't be reading this department—you can double the pleasure and satisfaction you get out of it by becoming affillated with the Guild. It represents the greatest step forward that has ever been taken in behalf of amateur craftsmen.

It gives them a chance to get together and compare notes, to learn new methods, to participate in exhibitions and contests, and to do a thoux and and one things that haven't been possible in the past. You are simply missing a bet if you don't join a home workshop thub.

Now there may not be a club in your locality. You can find out from the list in the right-hand column. It gives all the cities and towns in which Guild clubs have already been organized. If there is a club nearby and you do not know where it meets or who the officers are, send a self-uddressed stamped envelope to the National Homeworkshop Guild, 312 Harper Avenue, Rockford, Ill., for that information



One of ten silver trophes to be swarded in the National Concess each accompanied by \$100 in cash

In case you do not find your city or town listed. the thing to do is to get a few of your friends to join with you in starting a club of your own. Any five or more men or women over sixteen years may organize a club and apply to the National Guild for a charter None of the clubs now in existence has had the least difficulty in getting started or in finding a place to meet, and many of them have doubled and redoubled their member-

The advantages of becoming affiliated with the that d have been pointed out in previous articles, but Levern T Ryder president of the national organization, will be glad

to outline them in greater detail if you will fill out the coupon at the end of this article. You will also receive a bulletin telling how to obtain names of prospective members, where to hold meetings, how to call and conduct the first meeting, how to prepare a constitution and by-laws, how to choose officers, and how to obtain adequate publicity. Practically all the problems that are likely to arise in organizing a club have already been solved for you. All you need do is find a few congenial neighbors who are interested in some branch of craftwork, It doesn't matter if some of them are without home workshops and have little experience or skill, The Guild is for beginners as well as advanced amateurcraftsmen. (Continued on page 76)

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WANTED

A Craftsman's Club

In Every Town

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The local clubs are busy with their preparations for the National Exhibition and Contest to be held in Chicago, March 25 to 60. One of the targer rights has already informed the contest committee that it expects to have more than thirty entires ready. Even the anulier clubs hope to enter at least one project in each of the first mine divisions of the contest because that will give them a better toric in figuring their total points for the grand aweepstake prize of \$.000 and a silver cup. Cash prizes totaking \$7.000 and ten invest trophics will be given in the various divisions of the contest.

The Guild was organized for the benefit of the amateur craftsmen of the United S ares, but many inquiries have come from foreign countries. One group of Americans and Englishmen in China asked to be considered for membership. It was finally decided by the national board of directors that clubs organized in Canada would be recognized by the Could on the same basis as those in the United States. The first club to be chartered under this extension of the Guild's fir d of activities is the Moose Jaw Homeworkshop Club of Moose Jaw, Smithetchewan, Canada.

### LOCAL CLUB NOTES

With its usual progressiveness, the Topeka Homeworkshop club of Topeka. Karn has led the way again by being the first scal cub to probably a bulletin of its own. The first usue is a four page tolder carted "The Tupeka Homeworkshop Chiba News Bulletin. It contains the following introductory note.

"The Board of Governors has devided to put out an issue of the News Barrto as an experiment for the purpose of presenting our meeting dates, piace of meetings, and other information and news of general interest to remembers It is planned to substitute this publication for the present method of mailing cards and sy calling on the phone. " " There are a number of members who are very in-

### Clubs Just Started

The following new clobs have been organized and granted charters by the National frameworkship and since the January base of Populas Schwer Montain was published

Fort Wayne Civic Homeworkshop Club, Fort Wayne, Ind.

Greater Lawrence Homeworkshop Club, Lawrence Mass.

Habiand Humeworkshop Club I assettle Ky.

A anthomic Humeworkshop Club, Man-

Howe, West Homeworkshop Club, Morse Jaw Susk Canona

Morse Jaw Susk Carona North Shore Craftmans Club Stan-

kegan, III. Saigt Louis Homeworkshop Club, St. Louis, Mo.

Twin City Homeworkshop Club, Sterling, Ill.

These clubs are in addition to these tested on per consuming. At most clubs will be gamenaced in these columns as soon as possible after bring chartered

terested in the club, but for vanous reasons are unable to attend all meetings, and some are unable to get some parts of the meeting through no fault of their own, therefore the Board believes that this plan should be invaluable to these members."

Another editorial tells how the club started about a year aco with twenty members and has grown to approximately seventy-five members, with applications at each meeting

At a recent meeting of the club, P. A. Van Ks discussed the hazards of electricity and explained how the proper installation of equip-

ment saves money on the electric light hill Seventeen members and prospective members of the Holton Homeworkshop Club of History hans, were en estamed at a Dutch luncheop by the Topeka Ciub at the Topeka

### ADVISORY COUNCIL

Professor Collins P Bliss

Dean of the College of Engineering,

New York University

Professor Clyde A Bowman

Dres of the School of Industrial

Education Stone Institute,

Menomenia, Wisc.

Harvey Wiley Corbett Architect, New York City

Dr. Hugh S. Cumming Surgean Control. United States Public Health Service

Maj.-Gen. Benj. D. Foulous Chief of the Air Corps, U. S. Army

Capt. E. Armitage McCann Founder, Ship Madel Maker's Clob

Dr Francis G, Pease

Frank A Vandetlip Banker and Publicist New York

Chamber of Commerce. This followed an exfolial staged by three Topeka forms, a picture show and a hobby talk.

To obtain old toys that could be repaired for Christmas distribution, the Hoston Club offered a pieze to the boy or get who collected the largest number. Both Boy Scouts and G el brown cooperated.

Diomas B Owens president of the Homeworkshop Club of Cleveland, reports that the club new has a permanent home—a room about 6 by 12 ft on the third fluor of the Edm Building

We now have a place to hang our hate," he said, and our charter is hanging on the wall for the first time. We feel quite jubilan. Our meet up, were held in temporary quarters up to now. We can now go after a larger membership and have a more active and interes, or club thur present job is to get some furnishings troubled. Meetings are being held every week because of the competition an innounced by For it in Scitch to the some in one of the greatest thangs, and it has put enthusiasm into all of us. No matter who may carry off the honors of the big show we hope for its success.

W. M. Garrett secretary of the Capital Homecraft Club of Washington, D. C., reports that the attendance is very gratifying in spote of the fact that the club is so young. The membership has practically tripled since the first meeting.

The Iroquou Homeworkshop Club of West Springfield, Mass., draws its membership cotirely from a large local manufacturing conpany. It was started by five men in the research department

"Since we are selecting the members rather carefully at the start," writes R. E. Nest, the president, "we hope to have a 00 percent active membership and to cover many arts."

and crafts." The Tri-State Hobbiests Homeworkshop Club of Evansville, Ind., gave a demonstra-tion of wood turning and furniture construction recently us the shop of a local department. store. Chaton Hillyard made a floor, lamp from laminated black watnut and mapie before a group of merested spectators Among the projects exhibited by members of the club at the same time were a violin constructed by William Perry, a lacquered gun cabinet and walnut coffee table by E. B. Carpenter, secretary of the club a walnut clover leaf table and immuture covered wagon with handcarved onen by Mr Hisyard; book ends of elephant desum and two other pieces of wood carving by Thomas G. Standing and a scale modes of the Santo Marks by C H Ayer

The Middletown Homeworkshop Club of Middletown Conn., receptly witnessed an in-Middletown Conn., receptly witnessed an in-Middletown Conn., receptly witnessed an in-Middletown Conn., receptly witnessed from the Stanley Tools, who manufacturers of hand and electric tools, who are sponsoring the club woodworking divising of the National Connest. The club completed severa hundred over for Christman.

Lathe, bond-law jointer, and planer deminstrations have been given orfers the newly organized Civic Homeworkshop Guild of Fort Wayne, and The cash is growing rapidly and will soon pass the fifty mark

A hough it has not long been organized, the Atlanta Homerraft C ub of Atlanta, tan, has arready held one exhibit in a downlown store window Its members were kept busy ust before Christmas making and repairing toys for needy children

The Greater Lawrence Homeworkshup Club of Lawrence, Mass., broke a record by starting with sixty-six members

WEET
W QUE/T

Guest cards like thin are neeful in following up visitors who may later join the club

### FREE BULLETIN TELLS HOW TO START CLUB

WHY not have the honor of organizing a home workshop club in your own community, if one is not already in existence?

The next furthed of starting a club is outhed step by step in a free banelin you can have by filling out the coupon below. Send for it at once

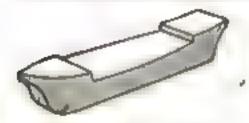
National Homew on Propular Scientiff Fourth Avenu	
edea and with a know	the house markship club or what the Na ton home- do for me. Please settl me or he strate self-addressed jet I am inclosing.
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City	State





# BUILD YOUR OWN SHIP MODEL

With These New, Improved, Simplified Shaped-Hull Kits



Sugar pine chaped half—main cuts attendy made. Seen to perish. Top general for the attent of mails, dock houses, etc.

Clipper Ship "Sea Witch" \$1.50
Postpaid

13 inches long—8 inches high. Famous and beautiful American Clipper. Kit contains every part needed including blue print, and pamphlet of instructions. Top deck of shaped bull stamped for location of masts, houses, etc. Kit contains paints, glue, chain, deadeyes, anchors, flags, printed how and stern name plates. \$1.50 delivered



U. S. S. Indianapolis

\$1.50 Pottpaid

Complete Kit for 12 inch model of the famous cruiser from which Pres.

Almost wholly shaped hull of soft augus pine with all main curs alroady made, sasy to finish



Roosevelt viewed the fleet. An excellent, graceful, racy model, easy to make with simple hand tools. Kit contains everything needed including paints, glue, anchors, propellers, rudder, blue print, pamphlet of step-by-step instructions, etc. \$1.50 postpaid

S. S. Manhattan - - - - \$1.00 Postpaid



Everything you need to make a 12 inch model of this largest and finest American built liner. A sharp pocket knife is practically the only tool you need. Kit contains paints, glue, blue print, pamphlet of instructions, 40 completely finished life-boat dayits, 2 propellers, 2 anchors, 1 rudder. All main cuts in the sugar pine hull already made.

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CID	STATE

THE MONTH'S BEST

Auto Ideas

Time-Saving Suggestions for Car Owners Made by Our Experienced Readers

HEN a wheel which must be removed sticks so hadly that it resists all of the usual wheel-pulling methods, I have found that the following procedure invariably works. First, I jack up the wheel on the opposite side of the car. This places a large proportion of the car's weight on the wheel to be removed. Then, after unscrewing the hub nut just enough to bring it out tlush with the threaded end of the axle, I strike the axle end several sharp blows with a heavy hammer. I have yet to find a sticking wheel that won't yield to the pressure and jarring.—A. D. H.

### Door Handle Cover

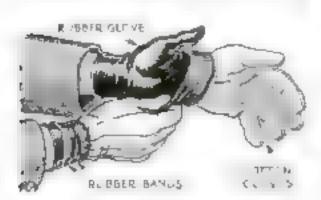
AFTER rain had twice frozen inside of the door-handle lock on my car, I hit on the idea shown in the drawing below. Cutting a four-inch length from a piece of half-lack diameter flexible rubber hose, I placed a one-inch slit in one side, locating it to coincide with the door-handle shaft. In cold weather, when there is the chance that snow or rain will freeze in the lock, I simply stretch the tubing to open the slit and slip R on.—B. S.



Rubber tube, allt and stretched over cur's deor handle, keeps talk from freezing in the keyhole

### Winter Car Washing

IF YOU have ever washed your car in cold weather, you are familiar with the chapped hands that usually result. After trying rubber gloves and finding them coul and much too fragile, the writer hat on the klea of wearing a pair of cheap cotton gloves over the rubber mes. The rubber still prevents the water from chapping the hands but the cotton adds the necessary warmth and protects the rubber.—FVA.



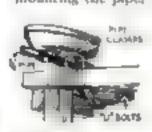
ANLE OFF FLUSH WIN END OF ARLE

A wheel that attche can be loosesed by ruleing opposite side of car and striking axis with hammer

### Home Vulcanizer That Is Easily Made



NEAT hot patches with ordinary cold cement can be obtained with an inexpensive home tire vulcanizer made from a discarded electric tron, a two-mich square block of wood a C-clamp, and a two-foot length of from pipe. First of all, the handle is removed from the from and the section of pipe bolted in place. Clamps made from strips of from can be used in mounting the pipe. The assembly then is bosted to the



filiustration above shows how to make a bome valentier and, telt, method of using it is clearly shown

bench with U-bolts in such a way that the bottom of the tron faces up and is about one foot from the bench top. To repair a tire, simply apply the cold patch in the usual way, place the patch face down on the tron, and clamp it firmly with the block of wood and the C-clamp. Turn on the current for three to five minutes and a hot patch will result—C. A. P.

### Headlight Pilot

WHEN driving a car equipped with a foot-operated dimmer switch it is of en difficult to tell whether your head-lights are up or down. To ware me when me head-aghts are up. I bought an ord-nary radio pitot light for fifty cents and mounted it on my instrument panel. The electrical connections necessary were particularly sample, consisting of one wire from the pilot light to the up terminal on the headlight side of the switch.—G. M.



This study installed pilot light on dashboard tells the driver whether lights are up or down



### Piston Ring Tool

IF YOU plan to replace the piston rings on your car and haven't a ring contactor, an efficient and inexpensive substeet from or bram. As shown in the illustration above, the strip is cut approximately one-half-inch wide and slightly longer than the total compressed circumference of the piston rings. When the two

shoulders, formed at the ends of the strip, are pushed together with a targe pair of phers, the loop contracts, compressing the piston ring just enough to allow it to slip into the cylinder. With a little practice, this tool can be used as conveniently as one bought for the purpose.—F 3.



# Editing Your MOVIE FILMS

By
Frederick D. Ryder, Jr.

THE day you start making your own home movies tell a story instead of being little more than an animated scrapbook, you a find that your friends will take much greater interest in seeing your pictures. Furthermore, the process of editing your films into a connected story form is easy and fascinating work.

cinating work.

Good film editing starts with the picture taking. No one can edit a story into a rec. of fam that a worth whose if there are no scenes to represent some of the most m portant things that happened, as well as lively abots of les-

ser importance to austain interest in the story and round out the narrative

On a family outing for example you might take a shot of packing things into the car, and her through the windshield as the car star ed a third as the tamby debarked at the outing place several more of the various art is less one of mother and the gails arranging the "eats" and so on. Then you would have enough material to be edited into a connected and interesting story of the whole outing.

In taking movies, never worry about the sequence of the various shots. The primary function of editing is to get them in the proper order by cutting and spacing.

The secondary function of editing films is to note what is missing and figure out ways to supply the debelency. If for mstance, you forgot in your hurry to shoot any scene of the actual start of your outing you are quite justified, as the film editor, to give yourself orders, in your capacity as cameraman, to go out and get that scene at the first opportunity. The next time the same members of the family happen to be going anywhere in the car, you can shoot a scene of the start, and this can be spliced into the reel of the outing. If the details are correct, your friends wou't know the difference, and in time you yourself will forget that it wasn't the real thing.

Editing your films also means figuring



The opline shows at the left is imperfect at indicated by the light eres, but that at the right will lest as long so the film

out suitable titles to be made by methods a ready described c? S. M. Aug. 54 p. 201. Top-noich editing also requires figuring out all sorts of little explanatory shots that can be made later on. For example, a friend of mine took some pictures on a trip during one of the hottest weeks of last summer. His first thought was to do the obvious than and include a title teding the thermometer reading. Then he had a better idea. His camera

focused down to a distance of one foot, so he took a large thermometer and made a closeup of it while he bold a match a few inches under the bulb and the mercury crawled nearly to the top. He spliced this in right after a title reading. AND WAS IT HOT!" Then be followed it with a close-up of one of the members of the party in his shirt eleeves, familing bomself with a newspaper as the perspiration dripped off his forehead. This shot, too, was taken in chilly weather weeks after the trip. The perspiration was merely water from a dripping wet towel with which the subject's face was mopped just before the button was pressed on the camera.

There is virtually no limit to

the possibilities of this particular phase of film editing except your own imagination and ingenuity

Another man I know has saved every foot of film he has ever taken-bad shots as well as good-on the theory that some of the shots will he useful. Recently he was editing a reel of night scenes, and dug out of his stock a shot his wafe had taken of a parade. It had been put in the discard because she had accidentally closed the lens diaphragm all the way, and the film was badly underexposed when considered as a dayaight picture. Titled as a right parade at became an effee are add ton to the other pight scenes!

The mechanical equipment required for film editing need

not be expensive nor elaborate, an ess you wish to go in for the more costly types of apparatus. The essentials are a film spincer, two handstrank it in-winding heads, some means of exam using he fam through a magnifying glass, and a way to hold the various strips of film white you are working out the proper arrangement.

A serviceable film spheer can be obtained for about a dollar. You can get a spicer mounted. Continued on page 81,



Another type of rack consisting of boy books screwed into an old drawing board. It is best for pag stripe

# Try a snapshot like this Tonight

HERE'S ALL YOU HAVE TO DO

Use Kodak "SS" Film. Set your camera for 1/25 second—Open the lens to f.6.3. Put 2 Manda Photoflood bulbs in lamp A—I in lamp B. Distances as indicated. Sight the subject, click the shutter—and you've made the picture.

THERE'S A NEW OPEN SEASON FOR SNAPSHOTS. Now you can make snap-shots indoors—at NIGHT! A new world of picture opportunities...

Just use any camera with an f.6.3 (or faster) lens, loaded with Kodak Super Sensitive Panchromatic Film. This high-speed "SS" Film does the trick—it's three times as sensitive as ordinary film under artificial light. Two or three Mazda Photoflood bulbs give ample light.

Hold the camera in your hands as you would outdoors, set it for 1/25 second, open the lens to f.6.3. Sight the subject, click the shutter. You've made a snapshot. Indoors...at NiGHT.



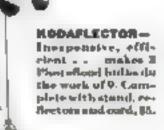
### ALL YOU NEED FOR SNAPSHOTS AT NIGHT



KOCAK "BI"—the Rightmingfact film, with the arrest lightning finishes on the familiar yellow her—the film that, indeces or out in any light, improves picture quality.



BULBS give brilliant furbt . . . lest for two bours. enough for many pletures. Cost but 25r.



### KODAK SIX-20

with Kodak Anastigmat hear f.5.3 is ideal for night snapshots. For pictures 2'4 x 3'4 inches, price \$17.50. hodak Stz-16, with f.6.3 lens, for pictures 2's x 4'4 inches, \$20,

ONLY EASTMAN MAKES THE RODAL

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Here's a back yea'll want in your Ebrury, Complete details about Indoor pictures with Photofood and Photofosh bulbs. Tells you have to make outdoor night pictures of lightning. Belief buildings, ferwarks. How to make manufight photos. Write to Eastman Kadak Company, Euchester, 'tow York,



 2.0.140

Gty State ....

# WHEN IS PIPE SMOKING ECONOMICAL?

### Count your hours of smoking before you conclude you are saving money

Some pipe smokers have punished thermselves needlessly in their desire to economiae by spending less money for tobacco. Buying lower priced tobacco, they have thought to save money. Often the saving is only in imagination. For example, a 15¢ tin of Edgeworth will provide more actual hours of smoking than many cheaper tobaccos. If you doubt this, make the test yourself. You will find that, using an average size pipe, a pipeful of · Edgeworth will give you fifty minutes to an hour's pleasant smoking. In actual experience you may find that the cheaper tobacco really costs you more in money while it gives you less in satisfaction.

Edgeworth is delightfully mild. Its rich tobacco flavor is the reason many a man smokes a pipe. A much longer

time is regulred to makeEdgeworth than is needed to make cheaper tobaccos, because every need of the pipe smoker is considered. At 15# a tın, Edgeworth is a very low-priced pleasure. Its use is genuine economy and also insurance of pipe happiness.

Many lovers of Edgeworth buy it in the vacuum packed ting, because the fac-

tory flavor and freshness are retained in these tins indefinitely, po matter what the climate.

Edgeworth is made and guaranteed by Larus & Brother Co., Tobacconista gince 1877, Richmond, Va.

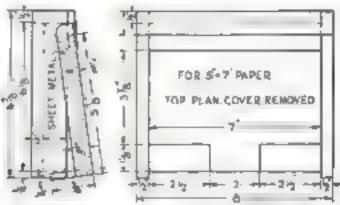
### BOX KEEPS ENLARGING PAPER HANDY

WREN a number of photographic en-largements are to be made, all of the same size, a box of the type mustrated below will be found a great timesaver. The ef-fort required to make a few of these boxes to at the most used sizes of bramide paper will well repay. The susping sides make the pack of paper splay out sufficiently to enable the

top sheet to be quickly grasped. The hinge is a communuous strip of leather

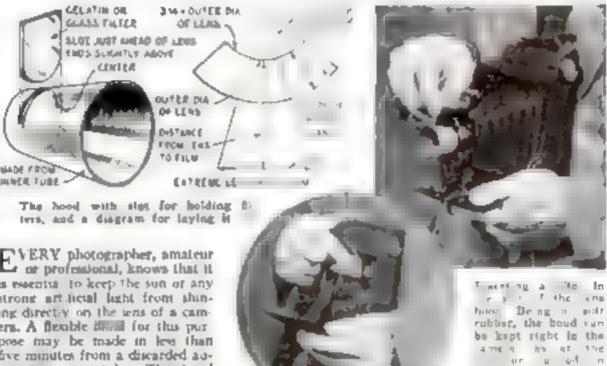
When painted a flat black, inside and out, the box will be found adequately tight, even in full daylight, for a reasonable length of time. Of course, common sense dictates that the darker the place in which it is kept, the better-Ross WHEELTON.





The box has aloping aides so that the top shoot of paper can always be quality grasped. The lid which has a long seather bings, is ressonably light-tight

### LENS HOOD MADE FROM OLD INNER TUBE



EVERY photographer, amaleur or professional, knows that it is essential to keep the sun or any strong art ficial light from thining directly on the sens of a camers. A flexible small for this pur pose may be trade in less than five minutes from a discarded aotomobile inner tube. This hood will also serve as a holder for color filters and screens.

To make the bood of the cotrest shape to afford manamum protection without obstructing the line of sight of the lens, proceed as shown in the diagram. Make a paper pattern for culting the rubber. Use an ordinary rubber inner-tube patch for cementing the two edges of the bood together; then paint the entire bood a dull black. The smaller end of the bood will fit sneety on the projecting shoulder of the less and will support the hood firmly

Color filters or acreeus may be inserted in the bood from the end, or more handily, through a slot cut just ahead of the camera lens tuelf. The latter method offers an additional advantage in that tenenounted, and therefore less expensive, filters and acreens may be used.-W E STEWART

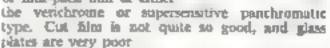
### PHOTO AWARDS

THE winners of our November 1934, photo contest will be announced in the March issue.

### Photographing Shiny Objects

ONE difficult problem for the amateur photographer is to photograph an object with alread highlights such as cut glass or polished metal.

The most suitable material for taking a picture of this type is exodern roll or film-pack film of either



The lighting should be as even and full as possible so as to get the high-lights well distributed and all of the surface well illuminated. The exposure should be a trifle under rather than over the correct value, and the print should be made on soft paper. Be careful, also, not to overdevelop the negative. All details will then be clear



Ame a spe of Pouled

### EDITING MOVIE FILMS

Continued from page 78

on a long board with a film wind at each end, plus a magnifier with a light behind the film, for as little as aix or seven dollars. Better models of splicers or complete editing units can be obtained at various prices up to thirty-five dollars or more.

Spheing film consists first in trimming the ends true and with the proper overlap. Then the emulsion is scraped from the film edge that faces up, special terment is applied, and the other film is set in place, back down. Pressure need be applied to the joint for only ten or fifteen seconds as the film terment sets very rapidly. When properly made, the joint is even stronger than the film itself

A FAULTY splies that splits apart while you are projecting the firm always comes from one of four causes. If you fail to get all the emulsion off, the joint will let go Too little cement will cause (touble. So will lack of proper pressure while the cement is acting. Finally, if you work so slowly that the film cement is partly dry before the film ends are put together, the joint will be weak.

One of the illustrations shows two firm joints. The right-hand one is perfect. The one at the left, made in the same splicer with a bit of delay in closing the joint, reveals a night area at one end. This indicates that the film is not cemented together in that area. Such a joint may get through the projector a few times without mishap, but is sure to let go when, in the end, one of the noise edges catches on something.

Fire joints do not weaken with me. I have made endurance tests on joints equivalent to running through the projector once a week for twenty years, yet with no signs of weakening

Two excellent ways are illustrated for holding short pieces of film while you are doing the rearranging and spicing. If you do any large amount of editing you will find that a number of scenes in short strips, when left on the brack will soon get into a hopeiess tangle. Aside from the time wasted trying to pick out the right one each time some of the film is sure to get badly scratched.

One of the racks is merely a frame at the back of the table with a crowdar to which a number of wonden map clothespins are at tached. The other is a board with rows of key hooks. The separate scenes are coiled into little rolls, placed on the books, and labeled with paper tags if desired. The clothespin method is best and quickest for short scenes, but it is not so good for long strips

An ideal arrangement would be a ruck of clothespire for the abort pieces, and a board, smaller and with fewer books than that shows, for holding the relatively fewer number of long strips.

### CELLULOSE FILM KEEPS AIR FROM DEVELOPERS

TO PREVENT the deterioration of photographic solutions left in developing tanks or other open containers, a good method is to foot on top of the liquid a sheet of transparent wrapping material of the cellulose film type. Cut out a piece slightly larger than the surface of the liquid so that the edges will fit tightly against the tides of the tank and form a good seal. No air can then reach the developing solution,—H. S.

### ATTACHING OBJECTS TO GLASS

WHEN any small object is to be photographed on glass in order that it will not throw a shadow, it is usually more convenient to place the glass in a vertical position. To attach the object to the glass, use a small piece of chewing gum.—OB

# TAKE SNAPSHOTS



It's easy...
get DOZENS
of pictures with
THIS LAMP



nacht the gennine

# INDOORS!

What a picture! How often have you said that about indoor scenes—and wished they were outdoors? Now indoor scenes are easy to snap.. thanks to supersensitive film and G-E MAZDA Photoflood lamps.

They're inexpensive too, for G-E MAZDA Photoflood lamps are good for two bours of picture-taking...last for dozens of pictures. (Great for home movie making, too!)

FOR SNAPSHOTS you need a camera with a fast F/6.3 lens,\* supersensitive film and a few photofood bulbs in bridge, table or floor lamps. Arrange your lights for a pleasing effect, then click the shutter as you do outdoors. You've taken a picture...indoors AT NIGHT!

Your druggist or camera dealer can supply you with film and lamps. General Electric Company, Nels Park, Cleveland, Ohio.

a due commen and show from fielding comments son and good photocols with time expenses of one to two seconds.



### FOR BABIES ... PETS ... ACTION

Get the picture instantly with G-B MAZDA Photofiesh lamps. Operate in any light socket or from flashlight batteries. No souse or dust. Emble even box cameres to get lively night shots. Each lamp gets one picture. Retails for 15 cents

# GENERAL & ELECTRIC MAZDA PHOTO LAMPS

FREE FOLDER. "How to Soap Pictures at Night"... tells which lamp to use and where to put it filled with helpful information. Paura

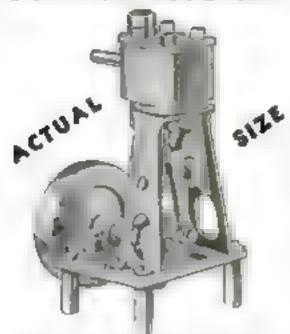
General Ele	atria Campu	my, Dept.	Min, Nebe	Park C	leveland.	Ohio

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State.

### TINY MARINE STEAM ENGINE



Printer ampropries of Alberta Spage | Secretary of Mindel Eng

made 50% with

NICHOLSON FILES——

A model has been cynically defined as a small imitation of the real thing. The tiny marine steem engine shown in actual size above is more than a model. It is the real thing, capable of driving a six foot boat faster than you can row a skiff.

Mr. Willis Brow, expert mechanic, says, "I made this engine from brass tubring and acrap metal, doing over 30% of the work with Nicholson Files.

"It was delicate work, exacting work, and I used Nicholson Files because I believe they are uniformly high in quality, sharp, durable. In abort, the best file value money can buy."

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For Our Model-of-the-Month

Club by Theodore Gommi

FICTION'S MOST FAMOUS SHIP

A Miniature Model Designed

# The HISPANIOLA

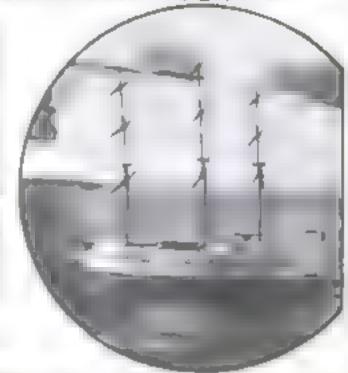
OF "TREASURE ISLAND"

AT THE request of many readers, we are interrupting our series of historic American ships to include a water-line model of the Hopamola as the seventh Popular Science Model-of-the-Month Club project. These who have read Robert Louis Stevenson's immortal 'Treasure Island' will need no urging to build this little shelf model of the ship described in that book. Aside from its associations with literature and adventure however the stop is one to appeal to any mustel maker.

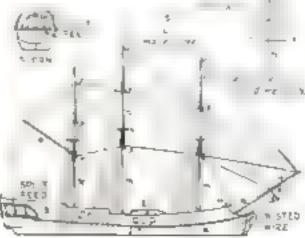
to any mindel maker.

For the plans from which this model was designed we are morbled to the Metro-Concurs Mayer Picture Corporation, which built a fad size He point is for use in producing the furtent screen version of "Treasure Island." The plans were drawn by Jim Havens, a marine expert of that contains.

Our model is built of early obtained materials to the (Continued on page by)



# A B C F G K ber f ar boo aboo aboo a and a c and a c

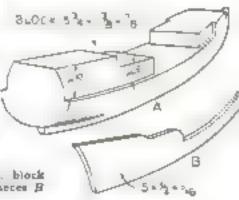


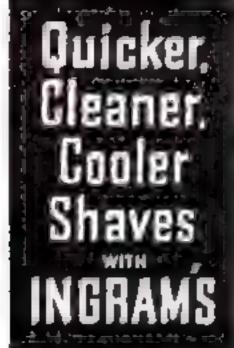
The assembled model and, at right, how the hull block as thaped and recessed to receive the bulwark pieces B

### NOTES ON CONSTRUCTION

A B C D B M and P are below F G K and L are a 64 m. th a fabor I and I are salve a of apin hambon about 1 64 in aquare Paris make a said water pure. The abin windows are spill reed. The right also No 100 black conton. The delights are ker a fine wire.

Paratrug Hull, med um grown. Docks and made of hi wa he, I ghe but Factings and spare, dark brown.









THURUGH ELECT SHALES



Try Ingram's Shaving Cream tomorrow morning, and enjoy a shave that a quick, clean and cool. , without a trace of sting or huming.

Lather-up, and see! Special ingredients in Ingram's cool the shave and tone the skin—keep your face comfortable while shaving ... protected against rawness when you ve finished. Ingram's lather is liner, too. It chings closer, wiltowhiskers quicker, and stays most all through the shave.

Even if you liked the shave you had today, try Ingram's and get one you il like better! Any drug store.

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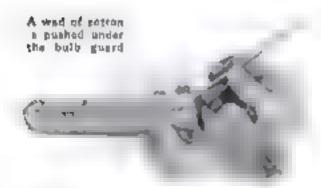


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### Two Whirling Thermometers Measure Humidity Accurately



Vapor in the are- is such an important factor in maintaining comfort and good health that more attention should be paid to its control. Here is an easily constructed instrument street psychrometer or hygrometer) that will indicate the percentage of relative humility.

Obtain two similar thermometers and fasten them together, back to back, with wood screws. Under the bulb guard of one thermometer staff a small ward it cot in Drill a by-up hole through both thermometers at the top Fashion a handle about 6 in long and fasten this to the thermometers with a wood screw Insert a washer between the handle and the thermometer and do not tighten the screw as this is a swinning joint.

Moisten the wad of cotton with a few drops of water. Then what the assembly for half a minute and note the temperatures on both thermometers. The wet bulb should now read a lower temperature than the dry bulb, due to the fact, but hear is required to evaporate the water. On the chart at the end of this article locate the dry bulb temperature at the bottom. For example, this ringist be 0 dez. Lo-

More weather articles coming! If you have written please be potient , and watch for the March take.

cate the wet-bulb temperature at the top, where it is inducated by the chargonal times. Assume this as of dex Now trace these two bines are they intersect from this point follow the nearest curved dotted lines out to the right of the chart, where the percent of bu-midity may be read. In this case it is 60 per cent. Thus is we not the confort rone in the chart and indicates good humidity. The shaded area is the comfort rone for writer, and will tell whether the water pain on the farmace or other air-





Chart for determining humidity from wet-	ert arting within a
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FEBRUARY, 1935

### GIVE

### YOUR HOUSE A GIFT THIS YEAR



ANY improvements you make in your home will be appreciated by the whole family all year round. This year your local Better Housing Program will make it easier for you to finance such improvements . . . Masonite PRESU-WOOD will make it easier to effect them.

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# HOUSE Our BLUEPRINTS

### A Gold Mine of Home Workshop Ideas

BEFORE you start a new project in your home workshop make it a point to study our list of blueprints for suggestions. The following is a partial list. In general appearance it looks the same is the fist published last month, but there are actually eighteen projects that have not appeared in any previous list, and new blueprists are being added from month to month.

Our blueprints are each 15 by 22 in. and cost 25 cents a sheet (except in a few special cases). Order by number The numbers are given in halic type and follow the titles. When two or more numbers follow one title, it means that there are two or more blueprints in the complete set. If the letter "R" follows a number, it indicates that the blueprint or set of blueprints is accompanied by photographically illustrated instructions which supplement the drawings. If you do not wish this supplement, omit the letter "R" from your order and deduct 25 cents from the price given. Instructions alone are 25 cepts each

Many other blueprints are available. Send a stamped and addressed envelope for a complete list

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### SHIP AND COACH MODELS

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Norm Full-size patterns for any boat marked with an a terick (\*) will be drawn to nester for \$1.50 extra. The part of the blue mote. About one week to request to fill orders for put etms.

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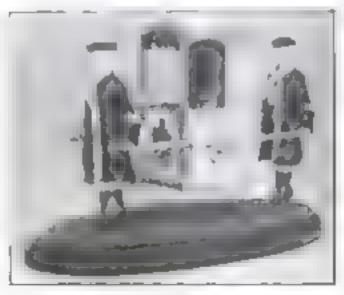
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MODEL OF A

### Queen¹s Sedan

### Chair

ARE you one of the milions of movin goeth who have been attracted by the gorgeous contacted and se tings of the many recent his is not pictures? If so, you can reconstruct for yourself on a miniature scale one of the most cutteraque conveyances of oden town a section that runed by Marie Less ryusks wife of Louis XV of France Our Biospithts No. 123 and 24 price 50 cents, a not a plans for a title in scale model standing about The in high.



### HOW TO RESTORE ALARM CLOCKS TO SERVICE

CLEANING a clock is frequently the only repair required to restore it to service. It is a simple process, as you may find out for yourself by practicing on your alarm clock

the next time it slops.

If, for example, you have one of the popular large alarm clocks, first loosen the three small acrews at the back near the rim, and twist the movement in a clockwise direction until the screws slip through the enlarged portion of the slots. Next, remove the two winding keys and the four slotted nats on the back, and slip the movement from this part of the case. Slip a pair of diagonal cutting pilets under the minute hand and ary at of Then remove the other two hands in the same way.

The dial is removed by strughtening the ends of the four itigs that pass through boles in the frame of the movement. Now pust out the small brain wedge that holds the end of the hairspring on the balance which, and turn the which until the end of the spring supa out of the slot, and also out of the slot in the regulator lever. Lower one screw at either end of the balance-wheel staff until it.

can be removed.

Dissolve some mild white soap chips in water, add ammonia, and suspend the movement in the solution from a wire for about five minutes. Then rime it thoroughly in practice, Brighting with a some paratrelled we remove any remaining dort. The balance wheel should be cleaned in the same manner but be very careful not to bend the hair spring It is a good idea to dry off the pasoline with a fan, or by placing the movement in the sunshine.

If the points of the balance wheel pivots are dull or rounded off, they should be sharpened. The shaft can be placed in a chuck of a small latter in available, and the pivots ground to a fine point with an elistone. An alternative method is to place the balance staff in a pin vise and rotate it with one hand while grinding with the stone in the other hand. A small slot can be filed at the edge of a bench, and the end of the shaft rotated in the slot with enough of the point protructure to grind. It is also well to clean out the depressions in the two screws in which these pivots votate

TO REASSEMBLE the parts, first replace the balance wheel, making sure that the pix on the wheel slips late the slot in the lever. Then thread the end of the hampring through the slot is the regulator lever and through the slot where it is clamped with the small brass wedge. Before clamping the end of the spring, hold the wheel so that the pix and the slot are in a straight line with the balance-wheel shaft and the lever shaft. Allow the spring to move freely, and then clamp at this position. If the clock does not lick evenly, the end of this spring should be moved a very lette in ether direction until it does

A few drops of aght machine oil should be placed on the mainspring and on the alarm spring, and a small drop of very light oil, preferably clock oil, on such hearing. Also put a drop on the balance-wheel pin, and a drop on each arm of the escapement. Use a piece of wire, about No. 22, for applying the oil to the bearings. Now the other parts may be assembled in the reverse order from which they

were taken apart.

In order to get the starm set at the correct position, put on the alarm-set hand first. Then turn the minute-hand set knob on the back in the backward direction until the alarm-set hand begins to turn backward. Turn until it is at some convenient position, such so three o'clock, then put on the hour and minute hands at the three-o'clock position. The clock now can be placed in the case and will be ready for use.—Bup Firster.



BRIYS

### JAMES MELTON

Famous Radio Star

I NEVER start work on a model," coys James Melton, famous radio star, "without first making sure that every one of my edged tools is recor sharp.

"I am working now on a scale model of my yacht 'Melody." On this job, as in the building of any planked model, I have to make innumerable notches and joints and these must be cut with the utmost occurrey to assure a tight fit. I keep my Carborundum Stoos within easy reach and give my cutting tools a few strokes on it at frequent intervals. I find the few minutes spent on this precoution are saved many times over in the course of a delicute shaping job, and

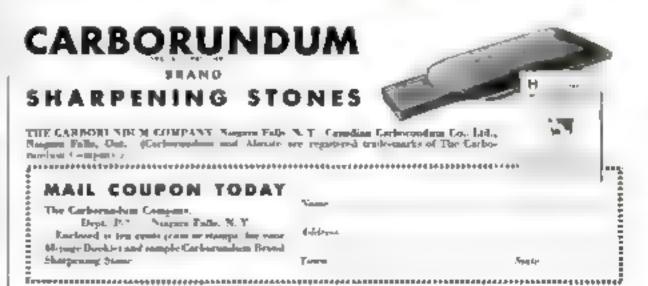
I can work with much greater confidence, knowing that there is no danger of splintering or other damage due to dull tools."

### Send for sample sharpening stone and 48-page booklet.

This 48-page book by E. Erickson, well known expert, has 17 large illustrations of the right way to sharpen each edged tool. A little study of this book and every look you own can always be just right.

It has a "How to Harld" section with photographs and diagrams of articles to be made. Instructuous are almple and easily understood. The exact amount of material for each article is listed. It is full of kints that will make working in your shop easier and help you do a more workmanlike job.

With this book you get a handy pocket sharpening stone—ideal for pocket knives and small tools. They are both yours for 10 cents in coin or stamps to cover postage.



# TO GET A STRONG HOLD OR TIGHTEN LOOSE PARTS

THERE is nothing else like Smooth-On No. 1 for solid anchoring, and in repair work, a Smooth-On job, costing only a few cents, restores full usefulness of many household fixtures, utensils and tools that would otherwise have to be discarded and replaced at many times the cost of the repair

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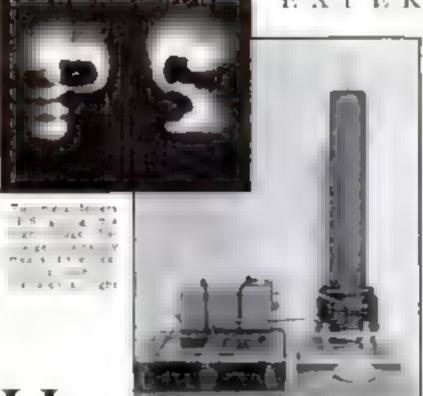


### SPECTACULAR

# High Frequency

EXPERIMENTS

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Aid of Junked

No. 14 rubber-covered were from which the instantion has been removed for a space of 1/2 in on each turn, as shown in Fig. 2. The wire is first wound on the form, the spaces to be bared are marked with a tharp knife, the wire is removed, and the mainstant on cut away. Secure the wire by removing the instantion from the end and passing the wire through

a small hole in the cardboard form. Insert the extended end of the first-made or secondary con into the same hole in the bottom of the primary coil, and glue in place. Then solder the lower and of the secondary coil to the lower and of the secondary coil to the lower and of the primary coil.

For the condenser obtain fourteen pieces of glass, S by 7 in. Old photograph plates from which the emulsion has been removed

FRE is a high-frequency outfit capable of giving a good J-in, spark and providing an endless number of word and interesting experiments, yet it can be built in a few hours time and almost entirely from salvaged materials.

Obtain a mailing tube approximately ? in, in diameter and 12 in, long, Cut two circular blocks of 1/2 in, wood to fit into the

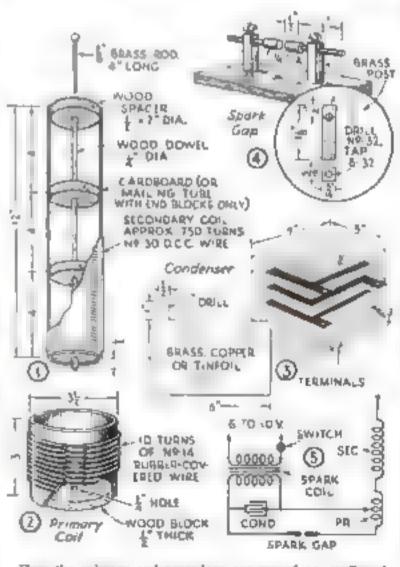
ends of the tube, and bore a 1/2 in bole through the center of one of the blocks. Glue a short piece of 1/2 in. round wooden rod in the center of the latter block and abow it to extend 1/2 in from the surface as a dowel. Grae one block in each end of the lube, shellac the tube, and allow it to dry

If a mailing tube is not available, a satisfactory substitute may be made by making a form at shown at Fig 1, wratging it with several layers of this cardboard, and securing the end with glue. No nails or screws abould be used to the construction of the high-

frequency coil.

Wind the cardboard tube to within 1/4 in, of each end with No. 30 double collon-covered were which will require approximately 3/50 ft or a fraction over 1/4 lb, Insert a 1/4-in, brasa rud, 4 in, long, in the top end of the coil form, and solder one end of the coil to it. Fasten a small metal ball to the upper end of the rod.

For the primary roll, obtain a cardboard tube 3 in, look and from J to 4 in, in diameter. A section of a salt or outneal box makes a good form. Cut a circular brock of wood to lit into one end, drill a 1/4-in hole through the center, and give in place. Wind the form with ten turns of



How the primary and secondary are would on cardboard tubes; the candenser and spark gap, and the wiring diagram.

are excellent, but any scrap pieces of glass will do. Cut thateen pieces of brass, copper, or tinfoil to the size and shape shown in Fig. 3. Drill holes in the tahs at the end of the sheet for connecting screws as shown. In stacking the condenser, place a sheet of glass on a flat surface, then a sheet of fod on the glass, another sheet of glass, then a sheet of foil with the lab at the opposite end. Continue until the condenser is as-sembled as in Fig. 3. The four should be piaced on the glass so that there is a margin of in al. the way around. Bind the con-denser together with friction tape

The details of the spark gap are shown in Fig. 4. Two brass posts are mounted on a

### A Low-Cost Outfit

EXPENSE need no longer stop you from building your own high-frequency apparatus Mr. Ford, who is a master at making fine electrical equipment from odds and ends, has designed this outfit so that it can be made at trifling rost. His plans are offered in response to the great interest shown by renders in our recent article on a much larger Tena cod (P S M., Dec. '34, p. 65), which required a high voltage transformer.

block of well-seasoned wood, and the adjustable electrodes made from pieces of 14in, round bruse rod soldered to \$4-in, pieces. The latter are held by means of No. 6-32 set

A vibrator type Ford agreeon coll will be required to excite the high-frequency coil. One may be obtained from any auto wrecking yard, but make certain that the condenser within the coil is not damaged. If the coil gives a bot spark at least 1/2 in, long, it will be satisfactory

The diagram of connections is shown in Fig. 5. The wire from the spark coil to the primary of the high-frequency coll should be flexible and should terminate in a spring chyto enable its being connected at any turn of the primary coil. The spark gap should be separated not more than 1/16 in. Connect the primary to a transformer or bottery of from 6 to 10 volts, and vary the number of primary turns in the circuit until the longest spark is obtained from the discharge ball at the top of the coil. If the coll in operated ta semidarkness, the effects are most spectacular, due to the fine rorons discharge that surrounds the upper call but is not visible to a strong light.

### RUBBER-STAMP PRINTING

A door imitation of printing can be obturned with a rubber stamp such as is used for impressing names on envelopes. Regular printing ink must be used. It is roked out on a sheet of giasa, which is used as a stamp pad. Only a thin film of ink is necessary. To prevent the rubber of the stamp from rutling because of the oily ink, sook it for several hours in a hot gelatine polution. Then wipe off the surplus and cout with a saturated solution of ammonium or potassium bichromate, and allow this to dry is sunlight for a day before using.-K. L. Rosatets.

### NONSLIP COAT HOOKS

Wine coat books sometimes allow clothing hung on them to slide off and fail to the floor A good remedy is to slip over each hook a short length of small rubber tubing, preferably of the ribbed type, so that it, will form a tight fit.-E. A. B.

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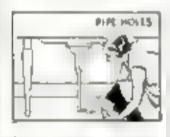
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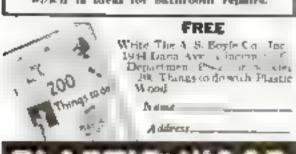
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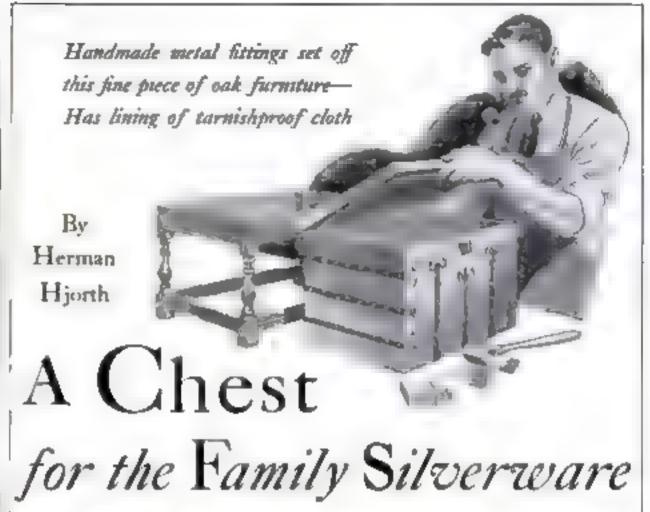
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bathroom fortures become loose, Plantic Wood can be to wante or me scally used to set the fixtures permanently fast and give a perfect appearance to the report

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HESTS are among the oldest and most remarks types of farnished types of farnished for bolding the family silver. The knives, forks, and spoons are kept in a tray supported on cleans, while bowls, pitchers, and other vessels are stored in the bottom of the thest Instead of a tray a hox made especially for flat saver and lined with farnishment cloth may be bought at a department store or from dealers in silverware. Tarmshproof cloth, which

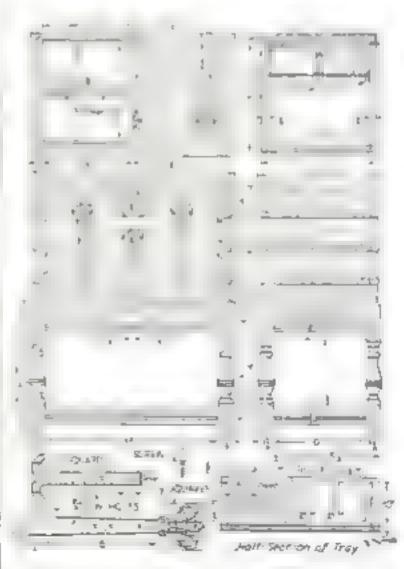
may be obtained by the yard, should also be used for covering the chest sides, bottom, and underside of list

The actual construction is very simple. A good grade of white oak is recommended. The front, back, ends, and bottom should preferably be glued up of two boards. These parts are then planed and squared to dimensions. The ends are joined to the front and back with a dado-and-rabbet joint as shown in the plan view. This joint may be made either by hand or machine, but in either case it is advisable to cut the dadoes

it is advisable to cut the fladness first and then plane the rabbets to fit these. The bottom is somed to the sides and ends with a groove-and-rabbet some way it is meeted at the same time the front, back, and can a are gland but no glane should be a med to the total or it be a med to the total or it be a content to which it bits is order that me bottom as somek or expend a little.

The lid should be glaced up of at least toree boards so that t will not warn. It is fastened the back of the best will three binger 11% in, wide and 1 in loos. A frame of a by the loop of the rhest I is screwed to the underside of the hid to that this closes very tacked.

The decorative metal fittimes may be ob-gauge brass, copper, iron, or monel meta-Cut to precessorers are and harvmormark them with a ball-bein hammer. A cardboard pattern. is then laid on the metal and its outline marked with a scratch awl or other sharp steel point. The holes for the screws are drilled, after which the outkno is sawed with a jeweler's saw and smoothed and rounded with a fac Bend besc parts at right ancles to 01 around hd and ades as shown in he sectional view, and drul 3, 16in, holes for the screws, which (Continued on page 59,



The stand, made separately, has a rabbet in which the chest rests. The Satware tray can be divided in any way desired

### CHEST FOR SILVERWARE

Continued from page 88)

may be obtained with square heads, either machine made or hand torged. The fittings should not be appared, however, until the chest has been stanted and finished

If the tray is to be made, it should preferably be dovetailed at the corners. The ptywood bottom is fastened with give and screws. The partitions and racks should be spaced to suit individual requirements and preference.

The chest is placed on a stand made of four turned legs, four rails, and four stretchers. It fits into a rabbet cut in the edge of the rails and the ends of the legs. These rabbets should be cut before the stand is glued together. Note that the rails are set flush with the legs, but that the stretchers join them in the center of the square part. The joints may be either mortise-and-tenon or dowel joints. A bead is made on the rails and stretchers with a scratch stock, as explained in previous articles, before they are glated to the legs.

The chest may be given a weathered oak or a brown onk stain If the jat er is used, a striking effect may be produced by filling the pores with white (natural colored) filler The finer is thinned with bearing or turpentine un-(II of the consistency of cream, pointed on liberally, and worked thoroughly into the pores with a brush. It is allowed to dry until it turns flat and the surplus is then rubbed off nortes the grain with a piece of burlap. After being wiped clean with a jost cloth, the filler is left to dry for twenty-four hours. Then one or two coats of very thin shellat are applied Rub the shellac smooth with No. 2/0 steel wool and finish with a coat of liquid wax. Let the wax dry several hours hel te rubbing to a posts with a court, or tie of

### List of Materials

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### MODEL OF HISPANIOLA

Con anned from page 82

scale of approximately i in, equals 25 ft Either pine or balsa wood can be used for the hall, although the fatter is easier to carve.

A construction kit with all the necessary balsa wood, fiber, split hamboo, wire paint, and other materials, and a full-sase blueprint and detailed instructions may be obtained for 50 cents (see page 102). These kits have been specially designed for the Model-of-the-Month Club, but other renders can obtain them, while the supply lasts, for the same price.

The full-size blueprint, detailed instructions, and itemized list of materials are also available separately for 25 cents. Order Blueprint No. 257

Members of the Model-of the Month Club are entitled to receive a copy of the instructions free, provided they send a self-addressed, stamped envelope

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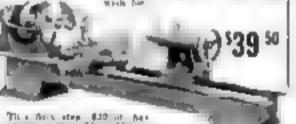
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### OLD TOY REBUILT INTO STREAMLINED TRAIN

(Continued from page 63)

tween roof and floor (made) is 11/2 in. Use narrow spacing blocks (1/2 or 3/16 in, unde) at the pivot end of each car. Place these far enough from the ends so they will not be in the way of the shields and so they come between two windows. Build up the back of the rear car and front of the locomotive with blocks from which the tail and nose may be shaped. Give these parts together

Jig-tayr the plan and elevation of the nose and tail to remove most of the excess wood, then shape to the proper contour with a sander or file. Also, since the cars are narrower at the top, sand the edges of the roof and finor sections slightly to get the proper streamhne taper, Nail small trouden strips, 3 to in. square, along all top and bottom eriges on the iznode of each car, set 1/32-in. in, to serve as supports for the window maternal which goes back of the sidepieces.

THE best way to mount lights in the large enough to push the lights up toto them. The sockets for these lights are carried on a thin strip of brass mounted along the center bottom line. Connect this strip to the house plate of the car and wire the center screws of the sockets to the third-rail shoe. Use 6volt inbular racho fames in series with a 100ohm resistance so the lights can be used with from 12 to 15 volt power. Higher voltage sampa can be used if desired, but these are inter in diameter

The detail of constructing the front end of the locomotive can be seen in the illustrations. A strip of brass 14 by 1/32 in is run all the way around the front, and a 56 by 14 by 1/52 in, ande is framed under the roof of the cab to hold the pose to the rest of the car and give support against collinous. Cut away all excess wood back of the nose (the exact shape is not important) to form an opening for the motor. The bumper bar is made of 1/16-an, square brass and is solstered against the 14 by 1/32 in, brass stopthat circles the front

The radiator grating is made of 1/32-in, beam wire, cut to length, U-shaped, and driven in like staples. The tross members and frame are soldered on. The cab windows are recessed to leave the frame of the windows to relief. The tab roof is an extra piece of wood 55 in thick, shaped to the proper lines. It is attached to the body by two machine screws (6-32 flathead) tapped into the brain strip that supports the motor

The headletht is made from a \$6-in. square piece of brass 115 in, long. This is dealed out to receive the light and socket and is rounded off at the top. A hole is drilled in the tim, near the front, to receive a \$4 in. telephone lamp cap with a clear lera. This takes care of the vertical shaft of light. The headlight is then mortised into the cab roof and attached with a 2.56 flathead screw from the anderside of the cab roof. This screw also carries a spring which grounds the light to the motor-supporting sterp. The center screw of the socket as wired to the motor's third-rail shoe.

HE ventilators on the cab roof are cut from 34 in, outside diameter brass tubing and inserted in holes drilled to fit. They are 14 in long and cut off un an angle on top, the slope being 1/6 in

A few final details can be added, if deswed. Each car should really have at least four vertuators, two at each end. They are semicylindrical in shape 1, in long, 4 in. wide, and about it in buth. The tail of the trace and the nose each carries two classfication lights. These parts may be mulded of plastic wood. (Continued on page 91)



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### OLD TOY REBUILT INTO STREAMLINED TRAIN

(Continued from page 90)

composition. The actual lights can be represented by glass brads. Also add a brass wire handrail at each door. This can be made from 1/32-an, diameter wire

Assemble all the cars and iry the parts to be sure they work properly. Then disassemble and paint. This is best done by spraying on two coats of high-profe larguer. Use a nch tan for the roof and floor sections, also the truck and motor skirts and the top and bottom of the shields. Paint the inside a gionay white. The graing on the nose includng a strip 1/4 in. wide all around it, is pusated. a canary yellow. Be sure to fill all cracks with composition wood before mantiax

If any furniture is to be placed inside the cars, it should be made and inserted before the sides are put on. A floor plan with all internal details may be obtained at the ticket

offices of the rathroad

The sides of the tay my have get brans pressboard, although lightweight brans "HE sides of the car are made of heavy could be used, if desired. They are 144 in wide and shaped at the noie and tail to fit the body lines. The heavy lines on the assembly drawings give their outubes. Lay out all windows as indicated on the drawings and photographs. Note particularly that the drawings show the left-hand side of the train, looking toward the locomotive. The right-hand ade in slightly different in respect to the windows of the first car, and the third car has no rear door on that side, as can be seen in the photograph that stretches across the second and third pages of this article. When the sides have been laid out, cut them accurately with a raror blade or chisel

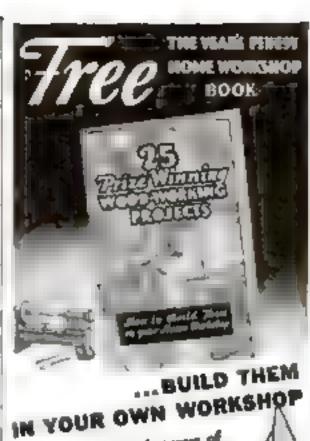
It is necessary, in addition, to cut out pieces of black 4-ply Bristol board as long as the sides and 1 1/10 in. wide, and lay out the windows as on the sides, but I 32 in smaller all around. These serve as window frames. Cut pieces of transgurent cellulose wrapping the more that as the window-frame strips to represent glass. Paint or spray the sidepeces. with two coats of canaly yellow lacquer

In mounting, place the cellulose film between each side and window-frame piece so the frames are properly aligned. Glue and nail in place. Reénforce the sides at all ends with lightweight abon bress, U-shaped, and enimped in place. Brase beading 1/64 in thick by 1/10 in, wide is run around the top and bottom edges of the cur Drift this strip every half lach with a No. 60 drill before attaching it with small escutcheon pur-Paint this strip red before applying so it forms a stripe between sides, roof, and door

The cars are now lettered in a rich tan or become preferably of the kind railed. Japan, colors." The name UNION PACIFIC appears above the windows on each car. These letters are 54 in, bigh and slightly wider than 1/4 in. The front car carnes the number M-10000 on both sides and the wording 1 NITED STATES MAIL RAILWAY POST OFFICE in two lines on the left side only. The middle car is labeled COACH and the rear car COACH BUFFET, Paint & narrow brown line around each door

The lettering is most important. If poorby done, it will spoil the effect of an other wise thoroughly workmanlike model. The task can be somewhat simplified by borrowing type of about the right size from a print shop. The type is taked by means of an ordinary stamp pad and then used to mark the letters on the train. After the aik has dried, the artises can be carefain painted over

Now check over all the details (sive the mot ir and trucks some oil, and let her run. You will have a mode, to be proud of, and one that all your friends will attrure



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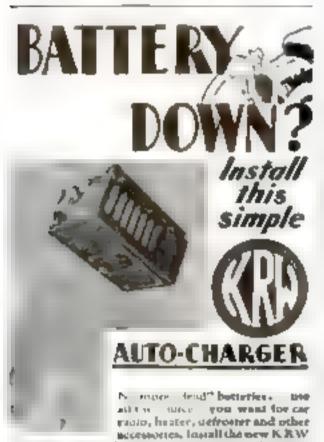
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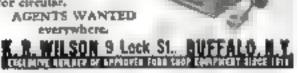
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### **UNIQUE CAMERA CASE**

(Continued from page 65.

tounting from the first. In every other row, the outside working cord is double-looped over the outline cord to hold it in place and to give an even edge to the strip. This is shown at the left in Fig. 2

After the thirty five rows have been made, extra cord for the sides of the case must be added. Four doubled strands of brown cord, each 10 ft. long, are looped over the nutline cord at each side. Continue by knotting the widened strip for thirty-five more rows, after which you can return the outline cord to the middle blue strip. Knut enough of the latter, about eight rows, to form the bottom of the case. This can be measured, over the camera, as shown in Fig. 3

You can now return the outsine cord to the outside, knotting in the brown cords until the case is finished. After knotting nine rows, drop a knot on each side, in the center, in making each row. This will form an in-



The case is sewed regether with the regular knotting cord threaded through a large nordle

verted "\" To the two middle strands, knot the middle of a 1 ft length of brown cord, as in Fig. With the latter, make ample hitches around each of the working strands (Fig. 5). This forms a part of the design for the front of the case. Continue with square knots in the center and at the ades of the design, forming the rough shape of a heart outlined in brown. The ends of the brown cord are knotted together at the back of the case, and made secure with household (cellulose type) rement, as shown in Fig. 5. Continue with square knots until the step is finished.

In ending the stelp, bring the outline cords to the meidle, and over them make hitches with the working cords. The final knots are then lightly remented and the cord ends severed with a range blade.

A length of the blue cord, threaded in a large darning needle, is used to draw together the rates of the case. You can then take it to the glove counter of any clothing store and have a snap fastener applied at a cost of about ten cents. When the flap is fastened down, it should come at the top part of the brown heart descen

The shoulder strap in made with two lengths of brown cord, one 32 ft, long and the other 9 ft. Both are run through une side of the case at the top. Use the shorter strands as filler cords, and over these make regular square knots with the long cords. The making of such a strap, which is very simple, has been previously described (P. S. M., July '34, p. 76). After it is knotted to the desired length, which is about 4 ft., it is need into the other side of the case.

### WAXING SQUARE KNOT CORD

To cave knotted cord articles a high polish, first run the cord through a cloth pad which has been treated with paste forniture was After the article has been knotted, rub the surface with a cloth.—K. M.



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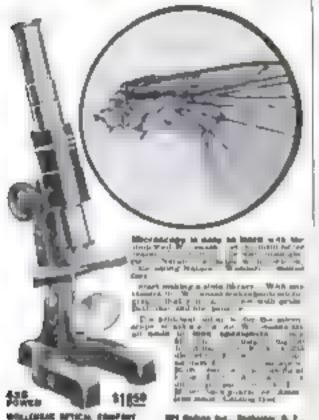
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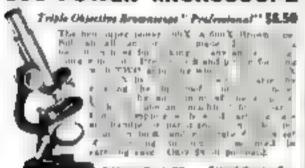
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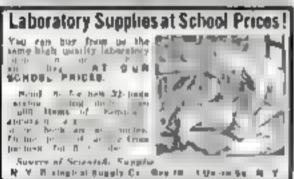
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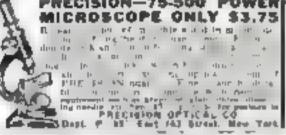
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### PLANT PARTNERSHIPS FOUND WITH MICROSCOPE

Continued from page 307

green chlorophyll that you have encountered in the reast of other plants for the long; are entirely devoid of this important plant substance and for this reason they are doomed to perpetual stealing of their food in ready made form.

The salls are perhaps the most interesting part of any mashroom or related fungus. It is the gain that produce the all-an ortant spores, which ravel on the winds and in the bodies of animas to other jusces favorable for the start no of new caonias. Such piaces are not numerous, considering the earth's and area or half each mashroom or even billions of them. It is to produce minous or even billions of them. It is to provide a great area in a compact space that the gasternation has been developed by the mushroom

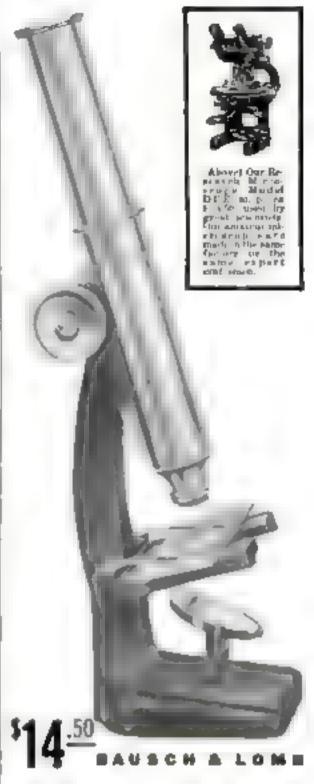
THE spores may be produced the Asinety the system of club shapen basisha that cover the surfaces of the pill plates, like masses of tenpus standing with their sides touching The basidia of the common mushroom usualy produce two to four scarly aphenical spores eath, the spores growing from little tips that project from the tips of the cost-shaped structures. The spores ripen, fall off, and are caught by the wind and carried away. Another common method of producing spores makes use of long, tubular peds, or tool, in which the spores grow like rows of beans or pens. When the spores are ripe, the podburst and liberate them. These different methods of spore production have given rise to the names Bandiomycetes and Ascomycetes respectively. Several other methods of bearing spores are known

With your microscope, you can see the spore-bearing basidia or other organs. Remove some pill piates from a mushroom, and tear them into small pieces in a drop of water on a side. Lay a cover glam over the drop, and examine carefully at 200 diameters or so Here and there you will find a perce of gill tusos that is arranged so that you can see the rows of baselia massed compactly on its surface. If the specimen has reached he spire tries on stace, you can observe the countless numbers of spores that have been given off. To collect the spores alone, lay the cap from a mashroom on a piece of glass or paper, and place moder a bell jar. The spores will collect on the support in a pattern determined by the arrangement of gills.

A LICHEN penerally is a union of an algaand a member of the Ascomytetes, Sometimes, when examining a lichen under the microscope, you can see the tiny spore-pods or asci. Incidentally, only the fungus part of the lichen secons to have the power of reproduction

Although the fungus apore serves the same purpose as the seeds of higher plants, it differs greatly from them. A seed contains a tiny embryo plant, while a spore is simply a cell that possesses the power to grow into a plant. When a mushroom spore, for instance, a his up a most laser of rich soil where growing conditions are right, it develops into a tiny speck of mycebum. This grows and penetrates the surrounding soil. Its job is to absorb food from the soil, to expand and to produce the fruiting bodies or mushrooms. When incistrooms are grown commercially the beds become interwoven with the mycelium threads. The bed material is compressed into bricks and sent to other growers who, by planting hits of the brick, can start new beds

Your fascinating examination of funn need not end with an investigation of the common mishroom. There are hundreds of other kinds of fund or mades, (Continued on juge 9.)



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### PLANT PARTNERSHIPS FOUND WITH MICROSCOPE

(Continued from page 93)

which you can find almost anywhere. A photographer one experienced considerable trouble because a tank in which he rensed films and plates became filled with masses of threadlike material. Examination showed that the maternal was a fungus plant, thriving on the gelatin that dissolved out of the film and plate contags. This fungus proved to be a beautiful object under the microscope.

Fungi studies can be carried on at any time of the year In winter mushrooms can be purchased from stores. A trip into the woods wall provide bits of decayed wood that will produce abundant crops of fung when placed in a warm, mout place, and achers that can be starred to life by similar (reatment.

"HE problem of making teasporary alides of fairly thick sections can be solved by a method developed in one of the government increscopic laboratories. This method consists of spinning a paraffin ring on a glass stade, to make a shallow cell. Paradin can be used when the mounting medium is water or some substance that does not dissuive it

Materials required include a synning wheel whose construct on a ready has been described in this series, and a stender was candie. You will have to make so h candles yourself for it is difficult to join have them

To make a candle outain a piece of brain pipe about one fourth inch inside diameter and 44x inches long. Plus one end with a piece of wood or a cork. In the coter of this cork, on the end that is on the pipe, fasten loosely a pin or small nail, and the to it one end of the heavy cord that is to serve us a wick The nail or pin must be so loose that it will pull out of the cork when the latter is removed. With the wick running up through the tube, fasten the latter in an upright poatton, with the corked end downward, and pour melted paratin late it. When the paraifin is on the point of becoming solid, adjust the wick so that it will be centered.

WHEN the wat has cooled, remove the cork from the lower end, and hold the wick in one hand so that the mold dangles below. With a gas or blowtorch flame, gently warm the mold evenly over its surface, until it drops off under its own weight. When carefully done, only a thin layer of wax will be lost. Straighten the candle while it is still pliable, and lay on a flat surface to cool

To spin a paration ring, place a slide on the wheel of the spinning machine, light the candle, let it burn for ten or fifteen seconds, blow out the flame and immediately touch the wick to the slide, which has been set spanning. The molten was of the wich will flow out on the glass and cool instantly, form ing a ring that can be built up to any protical thekness. Cells thus formed have remained intact for years,

The mexperienced microscopist frequently has difficulty with all bubbles. He discovers what he thinks to be a new kind of cell or animal, only to learn in the end that it is a troy air bubble that is drifting across the field of view. Sometimes these bubbles, acting as tiny lenses, produce beautiful effects. One of the first things instructors of classes in microwopy teach their students is to recognize an air bubble. It is a good sies for every beginner in microscopy to follow this rule, and study bubbles before turning his magic leases. on anything else. Production of air bubbles is easy, frequently exasperatingly easy. Simply drop a cover glass carelessly on a drop of water placed on a slide, and you generally will imprison at least one bubble. Water from a half-filled flask that has been shaken vigorously may provide an abundance of tiny bubbles, when a drop of it is placed insmediately on a slide and cover glass added.







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### SHOP LIGHTING TEST

(Continued from page 71)

by various manufacturers. You may hesitate at the first cost of installing them, but they

will last for years.

"Why not use a single 300-watt lamp over the bench, and save the cost of one reflector and socket?" you may sak. The reason for using two lamps of equal size is that they give nearly shadowless lighting, which is best for most bench work, whereas a single bulb throws confusing thadows,

WHEN the lamps are placed higher than 21/4 ft above the beach, they can be suspended directly over the front edge. Also, if much work is to be done in a vise that projects out from the bench, the lemp should be placed a little farther forward than the 6-in position.

For athes and similar machines, a single 150-wat, lamp am suspended a bule to the right of the faceplate end of the headstock spindle, generally is satisfactory. It is con-venient, you will find, to mount a lathe lump on a swinging erm, and provide some tacass of adjusting the height on well as the lateral

DOM: OF

Smith suggested a way in which a single lighting unit employing an R.L.M. dome can he made to do the work of several. Obtain a key socket, preferably one made of poece-lain, that is threaded for a standard fixture ring. With the ring screwed securely in the socket, the unit can be suspended from a small hook, and the hooks can be distributed over the shop so that the light can be moved where it will do the most good. Of course, you will have to provide sufficient wire to permit shifting. Use rubber-covered card and a rubber-jacketed plug. A lamp of this type is better, in most cases, than the more familiar but generally less efficient extension unit

It is convenient to have a socalized source of light on drill present band saws, jig saws, and simost every other shop machine. Then there is no trouble in directing light where it will do the most good. A 25- to 40-watt bulb is large enough for marhine lights. It must be shielded by a reflector that will direct the light on the work, yet will not be too

bulky

The unit illustrated in use on a million machine has a reflector of the approved type Made of metal, with baked-on enamel finish, it fits anugly about the bulb and has no useless bulk. The shade shown is priced at 90 cents, and the chromium-plated socket, cord, and plug cost 35 cents additional. The unit is fastened by a ball-and-socket arrangement that formerly was part of a 25-cent clamp for portable fixtures such as those sometimes emplayed by photographers. However, you can make a simple bracket by bending a narrow strip of metal around the socket, clamping it with a small bolt running through boles, and drilling the protructing 2- or 3-in, portion so that it can be fastened by a bolt already on the machine, or one put there for that pur-

Another convenient lighting gadget for the shop is a small bulb attached to the end of a flexible lamp cord so that it can be let into holes and restricted places where both from orthrapy sources cannot be directed. A 6-volt radio dial lamp, energized by a doorbell

transformer, will serve nicely Another still more portable unit consists of a flash-light bush on the end of a pair of flemble wires, connected to a standard limitery case. For unilar purposes a period lamp is the 3- or 6-watt S-6 Mazda, which operates on 110 volts. It is somewhat larger than the

other two lamps mentioned. Finally, the illumination can be improved by painting the interior a light color. It will show dirt more quickly, but that will serve es an indicator to warn you when a house-

cleaning is in order

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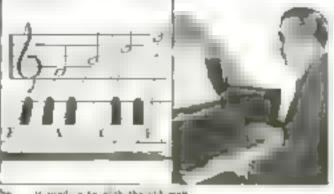
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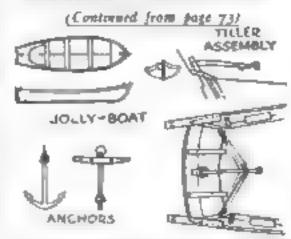
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### RIGGING THE SWALLOW



The 2-in. long july boat, the 1-in. long anchors, and method of rigging the timer

with single blocks, the whop of which fastens to the eye in the end of the channel, and the hauling part goes through a block strapped to the other eye, then in to the marails. The topping lifts are single, passing through blocks seized to the sprender at the masthead. The ends have single blocks and whips to the deck and purpuls. The stunsail booms can now be rove through their troop to extend a little beyond and have their inner ends lashed to the yards

The topsail yard is held to the most with a lashing through two eyebolts in the saddle and is rused with a chain tie passing through a hole at the masthrad and down about to a double block, with another in the waterways on the port side, so that the end comes up to the pinruit. At the yardarus, brace blocks are strapped on first. The ends of the braces are seized to the eye of the maintay, lead through the yardarm blocks, back through double blocks strapped to eyes at the ades of the main cap, and to the pinrail. The lifts are single, spliced to the yardarms, and second to the eyes of the rigging. Shoot blocks are used as before

The topgallant yard has a similar purrel to the topsail yard. The halyard is a rope from an eye in the yard, through a hole in the masthead, and down on the starboard arde to a ungle and a double block. The lifts and hraces are as before.

I gave my model such sail gear as would be left rove off during a short stay in port. The topicall sheets start with an eye splice, reeve through the yardarm blocks mentioned, along under the yard through blocks strapped to them amidships, and down with slade blocks and whips to eyes in the deck, the end going through the forward posts of the fiferal. The clew lines start at the heel of blocks strapped under the topsail yard, through hook blocks booked to the sheets, back through the upper block, and to the pinrail. The topicallant grar is similar, except that the clew knes are unde. Two buntline blocks can be seized to the topsail-yard jackstays, and one to the topgallant

The staysail and jib halyards have their ends seized to the eye of the forestay, lead through blocks booked to the top bank, and back to blocks seized stader the crossiversstaysail to starboard and jib to port. The downhauls intch to these blocks and lead through blocks seized to the stay at the jib boom and in to the forward pinrails.

The gaff topsail near consists of a halvard, the end of which is seized to the eyes of the regging goes through a book block back through a hole in the masthrad, and to the deck. The downhard hitches to this block and leads through a small block at the cap to the deck. The sheet also buches to the block. leads through a hole in the gall end, through a block under the past, and to the deck

The ringtail if used, is set like a stursail. The yard hossts on the peak downham to the peak, and the boom lashes to the main boom, or has an iron like the other stunsails.

Costs of rope on the belaying pins give a good finishing touch. (Continued on page 97)



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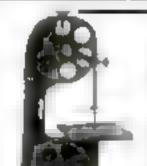


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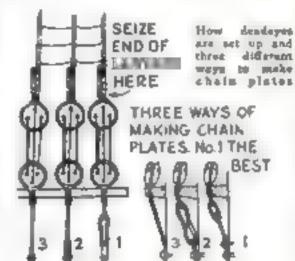
### RIGGING THE SWALLOW

(Continued from page 96)

These should, of rourse, be the actual ends of the ropes, but I find it easier and nester to beloy the ropes by taking a turn under the pin, then throwing a butch (with the tweeters) over the pin and cutting short I then make cons of the same size rope on a stick, tie them with one turn of silk, and glue them in position.

Two wood-stock anchors about I in, long are needed with them cables of about eleven links to the inch. The stags of these are hung to the catheads with the stoppers. Cards with a knot, go through the eatheads, through the ring, and fasten inboard to a creat or ring in a timberhead. The flukes are held level with the rail by the shank painterscords or chains around the crowns, fastened to box a in the waterways.

The cabies lead through the hawne pipes along the deck, under the ends of the table bilts, over the uprights, under the ends, and along the deck to the chain pipes. The stop-



pers are short ropes with a big knot in the ends, secred to boils in the deck. The chains are sailed to these to hold them back

This vessel should have several boats, but they dutter up the deck so much that I gave her only the jour-boat under the stern. It is I in long and \$5 in in beam and is hung with a double block hooked at each end the fall being trive through these and the sheaves in the stern davits and belayed to cleats or to the piprails. To make her hang properly, suspend a weight from the boat and then dope the falls up a stiff

The taxer ropes start from a bolt at the side, through a block seared to the timer back to a boit at the side, through a ring under the tiller, and the same on the other side, thus forming an endless tackle

These vewers were not entitled to pennants, but usuary flew them so I cave her a red and white one. The ensign of the 18.2 period has thereen stars and thirteen bars These hoist on halyards of thin silk.

The trucks are little balls. I bored mine first then shaped them with a file, and apphed gold leaf 't ou can add a small weather vane arrow at the main if you like. A jack can be flown on a short staff at the howsort cap. This is stepped in two little staples at the side of the cap.

The base can be any of the approved furme. I used graving-dock blocks SCIENS. are driven through two of these, up through the keel and into the bull. The blocks are then screwed to the baseboard, which is 41/2 by 13 in. The other blocks are merely fitted in place and glued. A shore will be needed on either side to take the strain off the keel. I bored right through the base, at an angle, then pushed them up and toensiled them

Remember that the water fine must be horizontal that is, the keet will be 5 16 th. higher at line HI than at line XI

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### THINK THIS OVER

The other day when I was opening up my morning mail I found a little folder enclosed with my life insurance premium notice—a pointe request for the name of anyone who I thought would be interested in selling life insurance. I did know of a young man who I believe could make a go of it, so I filled out the blank and sent it along

Having finished my routine mail I settled down to read a batch of "Secrets of Success" sturies that had come in that morning. Well believe it or not, but there was the most unique and varied collection of ideas for making money that I had seen for a long time. Those readers had good, workable ideas on everything from insect culture to sculpturing in concrete. I almost forgot that I was a hard-booled contest editor-I had become so interested.

But I am only human, and I supposed my mand wandered for a moment, but I got to thinking about that little life in surance folder again. Did I know of anyone who I thought could make good selling life insurance? Why I knew of bundreds of them-only I was not free to send their names! Practically every one of those entrants in the Sectors of Success contest had just the very qualities that make a successful life insurance salesman -instative-originality-energy. Now I wonder if this same thought has occurred

to any of you? Life insurance seiling has always offered exceptional opportunities—from now on even greater possibilities await the wideawake salesman. Conditions during these past few years have done much to make people realize the importance and the descrability of life insurance, From all milications, the life insurance business is about to enter a period of greatly increased prosperity. Thousands of policy holders, who found their life insurance an invaluable asset during the lean years will soon be ready to buy more, now that they are getting back on their feet. Thousands of others, who wish they had fortified themselves with this safe form of investment, will be in the market as times continue to improve. It certainly looks as though life insurance is going to be a

mighty good thing to sell

Of course, it is not my idea to persuade anvone who is happy in his job, and making a satisfactory living, to "cbuck" it and go into the lafe insurance business. But, judging from the ideas that come, in these "Secrets of Success" stories, alof these readers are giving some mighty serious thought to the business of earning more money Sometimes, when we are thinking very hard about some knotty problem, it is easy to everlook the simple solution. Perhaps life insurance is the solution for you. So take this suggestion merely as a remander to check up on what life insurance has to offer you

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### STARTS BUSINESS WITH STAMP COLLECTION

WHEN the firm by whom he was employed became bankrupt, a young business man whom I know was thrown out of work and most of his savings were swept away. Being interested in philately he decided to turn his hobby



to good account by establishing himself as a dealer in postage stamps.

His stock in trade consisted of an accumulation of duplicates, mostly of little value, an amateur's knowledge of stamps and the stamp trade, a fair business training and two hundred dollars cash, available for the venture.

He first budgeted his rapital about as follows, advertising \$40., stock and supplies, \$90.; postage, printing and other office necessities, \$20.; reserve balance. \$50. A room in his home was turned into an office; a rented typewriter completed his equipment. He, of course, was

his own stenographer.

For advertising he selected one popular trade weekly and one boys' weekly. He inserted a small classified advertisement in each for four issues. The advertisements featured an offer to send, postpaid, a packet gloriously designated as a "humdinger", consisting of 100 amorted foreign stamps, a perforation gauge and a small pocket album, all for ten cents. He purchased from a wholesale bouse sufficient quantities of each item to make up 250 packets. These cost him six cents a packet. The balance of his stock and supplies budget be invested in stamps of better grades, approval sheets and books, and minor accessories

By the time the first advertisement appeared the humdinger packets and a quantity of approval sheets were ready Replies came in encouraging numbers, and in each envelop ten cents was enclosed When he mailed the burndinger packets. he enclosed in each one a prize packet of five stamps with pictures of animals, birds or boats-these being chosen to appeal to juvenile collectors. The individually typed letters, that accompanied each mailing requested the recipient to send the names and addresses of three other collectors. When the returns from this prize packet appeal were complete a mailing list of five hundred active collectors had been accumulated, including the names obtained from the Hamdinger offer Both of these offers had been made merely for advertising purposes so of course but little cash profit resulted

The profitable business soon began to arrive in the form of orders for better grade stamps selected. The demand for books of better grade stamps increased. Some of these were available in the stock already purchased, others he obtained on credit from a wholesale house. Although some of the collectors, to whom stamps

# Secrets of Success These "Live" Lines of Work Will Need

### Trained Workers Throughout Your Life

How for you go in the business or industrial world depends more upon how you use your spare time than your working hours. You can learn how to do an ordinary job in a that time and if that a all you know, that is where you stay,



But if you use part of your spare time to learn how to do the next higher job, that's where you will go before long Get specroticed training, and then you can be sure of getting the better Hob and more pay that you want.

### Turning Spare Time into Dollars

### Architecture

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Holf the men and women employed today are working at jobs that did not exist 30 years ago. Every line of work described here will need trained workers throughout your lifetime.

All are either bosic lines, like Architecture, Business, Orofting, Electrical and Automotive Engineering, or new developments like Diesel Engineering and Air Conditioning, that have already built up a popular demand,

Therefore you can safety make any one of these "live" lines your life work.

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### Secrets of Success STARTS BUSINESS WITH STAMP COLLECTION

(Continued from page 99)

were sent on approval, were dishonest or careless in making returns, most of them were profitable customers who spent from a few cents up to two or three dollars at a time. Later he added special packets made up by countries and sets to his stock. The unsaturactory customers be weeded from the list and experience soon taught him how to reduce other leaks.

In a few months the business was earning a satisfactory profit. On one red-letter day, he sold a miscellaneous lot of about 8000 different stamps for \$300.

This sale was particularly interesting because of the fact that it brought a return, fifty per cent greater than the entire amount originally invested in the business. That, you will agree, was quite a record to set up within a few months of the launching of the enterprise. Of course, such a large sale is uncommon but the number of sales to must collectors has increased steadily until quite a sizable volume has been reached.

This business, which started so modestly, enabled this young man to become master of his own time. The work is congenial interesting and instructive and has proven more gratifying than the post-tion be lost.—J. H. H., Narberth, Penna.

### Cash Prizes

THIS department will give \$5.00 for every true success story submitted by readers of Popular Science Monthly, and which is accepted for printing in this magazine.

Manuscripts will be judged on the individual merits of the case and circumutances involved. Only stories in which the author's success, or that of some one known to the author, has been gained by some method of educational guidance, fitness for the job, or application to the work will be considered. We are not looking for the "get-rich-quick" type of story.

Manuscripts must be confined to 500 words or less. They must be true and, if accepted, authors must be prepared to give us signed statements to the effect that they are true. Manuscripts submitted and printed become the property of this magazine, and we are not responsible for the return of rejected stories unless postage is provided for this purpose. Address contributions to Success Story Department, Popular Science Monthly, 381 4th Avenue, New York City

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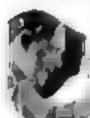




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To propert distortion in bonding small alamiaum and copper tubing, et helps materrally to clace one end to the mise, fill with heavy oil, and close the other end.

It may cost as much as the peice of a file to bave a tool chromium plated but it will last from five to six times longer, even on hard custings

A surface milled with a tungiten-carbide comented cutter will be 100 percent smoother than when protonery tonly are used. This cesult is due to the high speed obtainable while much lest heat it conducted to the

When individual preaches are lause because of wear, heat and cluse them up to size This will save you much time and passibly some sure kunchles

Discorded taps with centers make good grinding arbors to an emergency he grinding aff the thread free-hand, then granding to stat on centers.

While the III-deg angle of a drill is recognized as standard a 135-deg, magle will work better in drilling high-curbon alloy steel forgings and other hard materials.

Number drills ground to a spherical nose will serve as reamers to remove a few thousandths from a hole,

Lathe collets can be made to give added service by slitting them with a flexible eubber grinding wheel the length of the thread that has become worn, and pressing in a soft bashing with a 1/4-la, wall and about 915 en. larger than the hole en the

### GASKET CORK IMPROVES TABLE TENNIS BATS

Good table-tennis bats are expensive, and homemade ones of plywood with beconstick handles, even when faced with sandpaper are not altogether satisfactory. An excellent solution is to buy a sheet of gasket curk at an auto supply store for facing the bats. I paid only 11 cents for a sheet of cork 18 by 30 m. Give the bats one good cout of shelpe on both sides, and the cork pieces on one side only When the shellar has dried just enough to be very sticky apply the shellacked aide of the cork to the hats. The cork is then trimmed with a razor blade and the edges are beveled. after which the edges are smoothed with sandpaper - E.M.



### ARE YOU JUST HOPING TO LAND IN A GOOD JOB?

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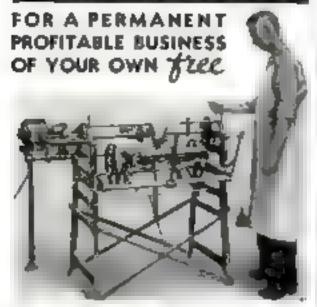
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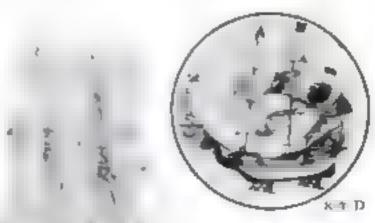
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STANDARD

# Ship Model Kits

Designed to save your time













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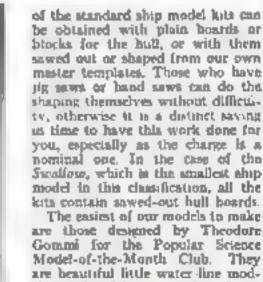
The Historic Marthad-Kit L.

day's time and www have to buy much larger quantities than you have any need for Besides, you will probably have to take some substitutes that will be harder to work with and will not give as good results in the finished model.

The kits contain only the raw matenab, but everything is of the best and is emetly suited to the particular model in which it is to be used. The strips of wood, for example, are cut to the corcect width and thickness in itself a considerable task. Wire,

riging cord, bran, fiber, celluloid, chain, tubing, and the like are all of the right size and

Note in the following list that all but one



blocks for the hull, or with them sawed out or shaped from our own master templates. Those who have jig saws or hand saws can do the shaping themselves without difficulty, otherwise it is a distinct saving us time to have this work done for you, especially as the charge is a nominal one. In the case of the Swallow, which is the smallest ship model in this classification, all the kits contain sawed-out hull boards.

8 T 10

The easiest of our models to make are those designed by Theodore Gommi for the Popular Science Model-of-the-Month Club. They are beautiful little water line models, made of bassa wood, and can be put together with no other tools than a pockethnife, some razor blades, and a pair of piers. These

luts contain all the raw materials, paints, blueprints, and instructions. This month's model is the Museusiola of "Treasure Island" fame. The simplified ship model kits form a third

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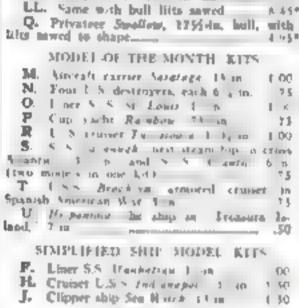
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and intermediate classification. They are of

the same general construction as our standard

models but are very much smaller and require

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6. Battleship U S.S. Texes, 3-ft 6-55

G. E exterb o galleon Revenue. 25-In 4 14

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D. Spanish galleon, 24-in.

ER. Same with hall lifts mwed

thad one its transport has been

OO. Same wish hall blocks shaped

furnished roughly shaped.

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No 4. Solid mahusany book trough in, long, 916 in, wide, and 24 M in, high over all Krudy to assemble, with Amshea...... 5.30\*

No 5. wild rock maple hanging wall rack with one drawer, 1936 in, wide, 3336 in, high Ready to assemble and stain included ...... \$75\* No. 6 I was may be bur erdy table top Die in healt, in Ready to assemble

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## Where Do You Go From Here?

You re like a million other men today-you're facing a big question.

The late depression turned business topayturvy and now the "New Deal"-the rebuild-

the period states you to the face. Where you are going from here in a question sod want answered right if you expect to get shead progress grow instead of standing a sl. A cithe to age that are appearing today going to the a matery of what withey mean in your cap along the Mater wall they got you have been foundly provided in a conf.

How the you take full advantage of this time—this term of it with its the index you will trid be accorded by a suggestion for monotonic or be or a street of better to be problem to you want transferent

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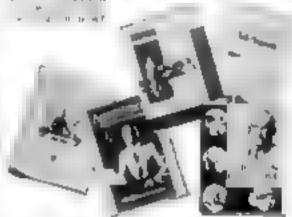
became act a six we gray and once ruk an important point a tre hands to a seen had not request the leases of 1920. Why should be, when right at this matters be can just a seen and get almost any man is seen a get in the congruenting for as new case one are an interest or gray man and every men a

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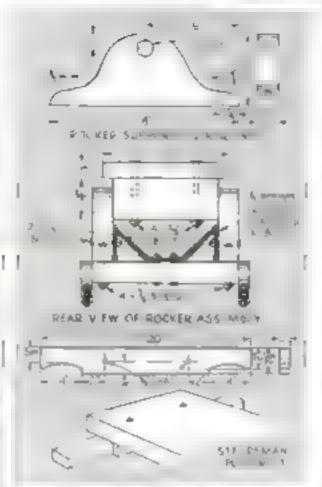
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American School



### HOW TO BUILD A LARGE BOBSLED

Continued from page 671



Rucher supports for the rear sled, how they are fastened and braced, and the foot sept

put on until the bobaled has been painted. After the rocker and rocker supports are in place the supports must be braced with iron rod as shown. This brace is 30 in. long. flattened at one end for stain bent at an angle of 45 deg and, beginning 5 in, from the bend, flattened again for 3 in At the 5-in point, bend to 135 deg, and at the end of the flat, to 115 deg again Measure 5 in from this dist bend and flatten again for st, or and bend to 45 deg. Drie a 12 in hole in the middle of each 35, in flat and two boles in the 5 in flat Place this between the two rocker supports, and bolt to the supports and cross lirace with 2% by 5q in bolts.

The spruce seat should finish about 11% by 12 m. by 11 ft, with the rear end cut to a semicircle for rursed to some degree) and the front end square. The top half of the turntable is placed 13 in from the front end, but before it is bolted the 10-in, perior bolt is inserted. Bore a 1 in bole in the center of the turntable deep enough to allow the head of the boit to drop just below the surface. Using the same center, bore a by in hole the rist of the way through

With the bolt in place through both halves of the turntable, turn the nut up on the lower end until about 1/16 in, from the wood. Mark the place, remove the bolt, and with the nut up to the marked place, drill through nut and bolt for a rotter pin. Put the bolt through the top half of the turntable and bolt this half to the sent. It is then braced to the sest at the front with a piece of iron rod flattened at both ends and bent to make an angle of 45 deg, between sout and upnight. The front end is boilted to the seat, but the other end is put on with screws as the pivot bolt prevents bolting this end.

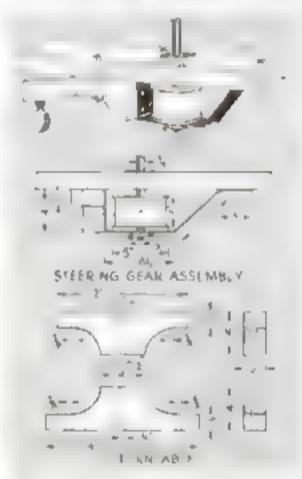
The footrest for the steersman is cut as shown and bosted to the front end of the seat on the underside. A piece of softwood about 1 by 1', by 18 in is fastened to the underside of the seat between the turntable and the iron brace for hotding two pulleys.

The steering gear will entail a trip to a machinist unless you happen to have a metal lathe, taps, and thes. The spool may be wood or metal, 5 to. long, 5 to. in diameter,

with a 34-in, hole through it for the shaft. If metal, it is fastened to the shaft with a key or set screw, if wood, with a pin or bolt. Be sure there are no projecting ends for the rope to catch on

The shaft is about 13 in long over all, with the lower end turned down to 🎺 48. In diameter for about 1/2 in, and threaded to receive a nut. The nut is put on, leaving a good 1/16 in, between it and the shoulder, and both mit and smalt are drawed for a cotter pin. The spool is placed on the shaft so that there will be about 1/2 in of the shaft projecting below

The steering gear support also serves as a brace for the turntable. It is made of 2-inthat pron with three bends—the first 4 in. from one end, the second is 614 in from the first, and the third is 51/2 in, from the second. The first bend is 90 deg., the other two are each 135 deg. A 35-in, bole is drilled through the center of the 6% in length, and the from es cut off A in beyond the last bend. Four screw holes are drued and countersunk in the 4 in, surface, and a 34-in, hore for a bolt



Method of mounting the steering drum and pulleys, and layout for the turniable parts

is drilled in the 3 in, end. The 4-in, end is fastened to the rear of the turntable, and the other end box ed to the seat board.

A 1, in hote for the shaft bored through the sest directly over the 1/2-in, hole in the support. This will be stronger if a short piece of the 2-in. Iron is also drilled 1/2 in. and placed around the hole.

The seat is now fastened by Inserting the pivot bolt in the lower half of the turntable and holting the rear sled rocker to the plank. The rocker should be placed about it from the extreme rear of

Bore a 1/4 sn. hole through the toe end of each forward runner, just inside the irons, for the steering rope. To hook up the rope, tie a knot in one end and pull the rope through one of the 14-in, holes (from the outside towards the center) and pass it through the pulley on the opposite side. Continue on around behind the spool, taking one or two turns around the spool, and bring the end back through the other pulley and out through the remaining 14-in, hole. Pull the rope as tight as (Continued on page 105)

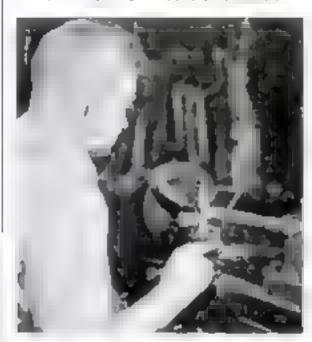
#### BOBSLED BUILDING

(Continued from page 104,

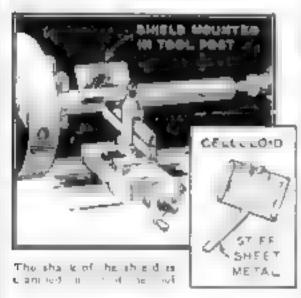
you can and tie a knot securely in the end. The entire sled should be given three coats of paint, preferably bright colors such as red, green, or hoe. After the point is dry, the runner trons are put on and polished with emery cloth and steel wool.

If running boards are desired, they can be made of softwood about 1/4 by 11/4 in, by 10 ft., and braces can be made by benches and flattening the ends of 15-in, round from The braces, four to a side, are bolted to the underside of the seat, and the running boards are boiled to the braces.

#### SHIELD PROTECTS EYES WHEN TURNING BRASS



O SAFEGUARD my eyes from chips when turn ng brass, I use a shield made sa Blustrated. Brass, tan, or other staff sheet metal was serve for the frame. This is fitted with critaloia from an old sale curtain or with panglass. Coase also may be used, withough it amore skely to be broken. The shank of the shield is mounted in the tool post directly on top of the tool, and the screen it set quite class to the work. I have used such a shield for about thirty years, yet it has been renarded as a novelty in each shop in which I gave worked .- ANTON HACKEL



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By wassering a sheet of glass between the lens of an enlarger and the enlanding easel, the amateur photographer can easily make soft-focus enlargements. The effect of the glass, which should be held 4 or 5 in from the lens, is to give a result that resembles photos produced with the aid of a costly Bull-focus lens .-- Robert J Blossen.





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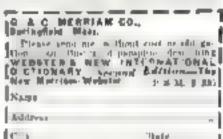
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#### ALCATRAZ—AMERICA'S DEVIL'S ISLAND

(Continued from page 21)

of incurrection. Not can any octoner receive man directs. Each ever a courd by a guard to a most the presume a of budden we are or old messages in ring into the presum. When a feton is permitted to receive a vocator he and his guest so in argust a tooms and talk through a periods and but it period gass set in the center of a thick wall. The periods are on small to permit the passage of any objects.

Named material He across with sweetal other non-closes operators in a Pullman car ferred across ban brancisco has on a barge bester service men sand guard within the car at both ends and outside on the barge. The sixty-five-foot prison faunch, manned with sharp-shooter guards and flanked by coast guards to the barge as it approximately made to the pagest the pagest these across the pagest these across the pagest these across the pagest these across the pagest the pagest to the pagest to

First R lowers reached by high ca washed for in the prison was command a view of the entire sound. As the sounds here that, is the entire sound the sound the sound that a series to not one mond tirel door. Then the out a tar door part and her is of their instances a sit red open in through which the goard projects them and many he with a forth door. I so id steel The outer door retain to open during the day but to of the other three man be opened at any one me. When soch up time are seen in the evening the opened except by the warden or his first deputy notal morning.

After the usual receiving routine and otorne of cluthing the prisoner is led in his crit a tiny room four feet wide and right feet ing He firsts timeelf on one of hise torn in the high or tight to again cell back. As he to be trough the bars he notes that nowhere is a historic place. He firsts in his cell no times with might be to assumed to aid in measure has his constants a cell of that I sib against the wall two sens or sea the stry heares a narrow shelf containing three giveted books for clothing, a toilet, and a small bases. Assile from here conveniences the givener is at milest two towich tooth powder and brush, and a cup

The burred cell dones are operated from twenty-four boxes. At both ends of the cell toxes are barred corndors patroned by armed guards. There is no preachle acress from the corndors to the cell coom and, like the presoners, guards are locked in until relieved. On the ground floor and in the cell blocks, guards move unarmed among the prisoners. This being prevent acquestion of firearms by prisoners.

While notcomed by society the felors recrive excellent care and trea ment so long asthey maintain prison peace. On the second first are a surgery and demai saboral sy with federal due se available. In the surgery are two barred one bed wants for jacents who cannot be trusted with another in the absence of a guard. At the opposite end of this floor are the assemble by with stage and piano Next is the library. In the basement are the barber shop, showers and storerooms.

A small part of the scand emborate works have been set up outside to present escape. Surrounding the prison building is a liverisation will Whenever presoners are ed outside the walls for work in buildings at the opiosite end of the island, they march between guards on the walls and within the runnel lowers but they are that confined within a cyclone fence and barbed ware entanglements.

spread along the rocks between the trest and the water line. Even the gates through which they pass are controlled from a high tower furty feet above their heads

Although Alcatraz is considered to be the most nearly escape-proof prison ever devised, the radio transmitter, installed a few weeks age by coast guard forces, flashes its daily tall to the coast guard Mation at Point Borits, six miles distant. Across those six miles one day may flash the warming that some public enemy has escaped. The warden maintains telephone lines to Forta Mason, and McDowell and the Presidio at San Francisco, yet should a wholesale delivery attempt involve cutting the telephone cable, the prison operator, safe within his harred radio room, can send the equivalent of an S O 5 to KGPD, the San Francisco police department's station

Until recently the arracks. Though surrounded by water, several desperate prisoners have attempted mcape in years gone by The first escape occurred in 1862 when three prinopera from the California volunteers fied their chains, cut their way out with a hatchet. lowered themselves from the north battery by a rope, walked around the miand to the dock, and fled in a confiscated boat. Several others forgod pardom and walked out through the front door, In 1908 one man escaped by boat. Four years inter two sawed their way out, but were found several days later, nearly starved, underneath one of the prison bundlogs. During the last twenty-five years, twenty-five military prisoners have escaped, but not one of these twam away.

No prison in history has been so well fortified and so well manned as the new Alcatrae, Not only can a powerful combination of minitary, naval, main, and federal forces be converged in a few minutes toward the prison, but the guards themselves are Uncle Sam's best. Warden Johnston visited prisons at Atlanta, Leavenworth, Lewisburg, and McNetl's mland to hand-pick veterant who already had proved their calm judgment, bravery, and intelligence. Then he sent them to school at McNetl's island where they received special instruction in every phase of safe-guarding the world's toughest criminals. They are today skilled boxen and wrestlers, expert in use of fire arms and proficient in jin jitus.

Warden Johnston, gray beined and small of stature, knows his prisons and their inmates lie was thrust suddenly into the wardenship of Fiscon Prison, which houses Canfornia's three time losers and lifers, while chairman of the State Board of Control in 1912. Prisoners were in revolt, but in a short time Johnston abolished corporal punishment, improved the discipline, and attempted prison breaks and riots coused.

The following year he was moved to San Quen a Prison where, until his tenure cessed in 1915, he sought to reform the inmates and give them work to do, thereby taking their minds from plot-hatching.

UPON him and his forty guards rests the responsibility of keeping secure such notorious underworld characters as Al Capone, until his imprisonment the nation's "ace enemy, George (Machine Gun) Kelly, Harold Fontaine, emugaler of guns for the Leavenworth break in December, 1935, Harvey J Bailey and Albert Bates, who kidmaped Charles F Urschel, Oklahoma oil man, Thomas Underwood, Charles Berta and Stanley Brown, who helped abduct Warden White of the Leavenworth prison in the break three years ago; W D May and O D Stevens, who slew three Tenans and, for good measure, held up a train in 1933, making oil with \$72,000.





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#### CHEMICAL STUNTS WITH CHROMIUM, MANGANESE

Continued from bage 481

and expose it to the light. Naturally, the compounding of the mixture and the drying as well as the application of the negative must be done in the dark.

After several bourt of exposure, retrove the negative and immerse the card in water Strange as it may seem, the portions exposed to the light will remain black while those covered by the dark areas of the negative, or opaque cut-out figure, will disappear

"HE explanation is a sample one. On the Portions exposed to the light, the glas is rendered insoluble by the ammonium bichromate and holds the lampback particles while on the covered portions, no change takes place and the glue is readily dissolved.

Because of the amount of oxygen it contains, lead chromate also is valuable as a test material for organic substances such as starch, sugar, or coal. Mixed with an equal amount of coal and heated in a test tube, for instance, it proceeds to oudine the carbon to form free carbon-diuside gas. The presence of carbon dioxide can be shown by bubbling the escaping gases through lime water or barium hydroside solution. A characteristic white precipitate will be formed

Our first ranged with the compounds of manganese came in our early experiments with oxygen (P S. M., June '32, p. 64) In the preparation of payers, polassium chiorate was heated in the presence of manganese dionide. Although the mangagese dionide did not enter into the actual reaction, it served to therate the oxygen at a lower temperature

The home themist can again make good use of mangapere distribe to commound a historious mineral characteur in the form of a chemical that changes its color as if by mage. First of all, more some manganese dioxide with solid potassium bydroxide (causmissate | le invoma lisma a bea (danted nitrate and heat the brownish-black powder that results in a flat tin-can top held over your laboratory burner. When it appears dry allow it to cool and finany stir it into a beaker of water. With each precipitation of the various oxides of manganese, the liquad will appear first green, then red, and finally laws

POTASSIUM permanganate in not only one of the most colorist of the mages nese compounds but it also claims the distenction of containing more available oxygen than any other substance. These characteristics give it a place among industry a useful themicals. Its ligh oxygen content makes it valuable to a permicide while its color makes it useful as a stain for wood. animal, and vegetable matters as well as metals and cements

his large oxygen content also made potassium permanganate valuable in the World War. Based on the fact that strong glycerin takes are if it is poured over potassium permanganute crystals in the presence of sulphuric seid, tumque stooke alarma were arranged to warn soldiers of the approach of enemy troops. Thin glass tubes were filled with glycerin, scaled, and placed in a shight ly larger glass tube containing powdered potassium permanganate. This tube in turn was inserted into a third tube containing five parts of sociam extrate, two parts of salphur and one part of antimony sulphide

In use, these bombs were hidden in the soil and grass at strategic positions. When tramped upon the three tubes were broken, the gly cerin was ignited by the potassium permanganate, and this fired the antimony-sulphur mixture to produce quantities of smake. In this way any activities of bostile soldiers was unmediately made known.

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#### CAN SCIENCE RAISE THE DEAD?

(Continued from page 13)

taining one part epinephrine in 1,000 Five minutes after the man had collapsed, the solution was shot directly into the left ventricle of his beart. The effect was atmost instantaneous. Within thirty seconds the man had beeun to breathe and his beart had resutoels brating

Since then, such wonders have become commonplace Hundreds of persons have been saved from death men and women who had totalised while undergoing operations, infants apparently stabors, and presons seemingly shocked to death by electricity. The method employed has become standard practice the hospitah and has sometimes been put to sufpriving uses, as at Detroit not long ago

O'E of a feeing gang of bank robbers had been shot by pouce. The wounded man, apparently lifeless, was taken to a bosqu'al and given a shot of adrenatin. He regarded consciousness fring enough to give police the names of his companions

In no case however where a human being has been revived could physicians assert posdively that the subject had actually died. This is not strange because no one so yet ran say just when a body day. There is, it appears, no such thing as sudden death.

It is sometimes supposed that life ends abruptly like an electric light switched off Actually death is a non and gradual process, like the breaking up of a vast rolumn enquire. The capitals, the brain and heart die first Crissenewhere is the body which may be compaired to rolonies do not immediately experthey are but doomed to eventure destruction No more surcises in the form of assert at rive from the capitals. No employeements come to help them fight of destructive chemiral changes and bacteria.

The cells themselves might, if nourished, enstance not only to live but to multiply Twenty years ago, scientists at the Rocke feller Institute placed a fragment of living tinsue from the heart of a chicken in a culture solution. Today the fragment still lives. In hingland, another experimenter placed a mimore particle of a frogs spanish marrow in a test tube of summer solution. The particle lived for fifty-eight hours and lacremed its sus hundreds of times. More recently, English scientists have shown that living tells taken from animal skim and placed in suitable culture can be made to grow hour or wool inde-

It is difficult, therefore, to determine just when life ceases in the human body and death begins. The customary tests, short of opening an artery, are not infallible. Stoppage of the heart and cenation of breathing, although they always accompany death, are not arways pro-la of its occurrence

An incident that took place in London shows how certain diseases and secures such as atalejay and shocks, can leave a person to pearly dead that medical examination sometimes fails to detect the presence of life. A boy was picked up for dead in a park and burned to a hospital. A constituace of death was issued and the body removed to a mortuary. After a time the box's mother arrived She scouled indegrantly when actendants told her the boy was dead and to their constraintion, displayed three previous death ceruscates for him Later the boy was revived and walked borne with her

EVEN persons in perfect health have been known to substate death. In a celebrated exhibition at Labore India, a Juliu named Harodas went voluntarily into a trance that convenced we messes he was dead. He was sewn toto a bag placed in a deal box and buried in a grave several feet deep. Sentries stood guard over the grave for forty days. The Jahn was then exhumed, his eyes and mouth moistened with water After a few moments he sat up and asked for food.

Under the pecessity of discovering some meant of detecting death with absolute certainty many methods, some grassome have been evolved. One is the extremely sensitive instrument known as the electricardingraph When applied to the chest this device indieater the abghtest flutter of the heart. An electrical test was discovered about three years ago by Dr George W Crile, of Cleveland, Ohio Borly cells, he established mainta n an electric charge through chemical action Indeath, this charge fails to zero. A French phymean Ity Irard, injects a venew dve in a the veins of the person supposed to be dead, If the subject is in a trance, the feeble circulation that persists in the body carries the dye to the haing of the eye-lich, coloring it yellow

BEFORE the development of these tests, people were periodically swept with puncat the thought of premature burial. A quarter of a century ago, Le Figuro, the Paristan newspaper, cited during its crusade for more stringent tests 400 cases of supposed premature interment. As la c as . M. an English writer collected existence of 00 such cases.

The awe in which death was held by an-

cient peoples was inspired not by fear of revivilication but by the mystery and inevitability of death likelf. Hedged about by superstations and religious taboos, primitive men had no desize to see the dead restored. They believed that to interfere with the dark proccoes of death was to court fearful evils. Even the intellectually advanced Greeks of the Homeric era held such a belsef Asseulaisus, the mythical here who was the world's unit physician, became so skined in postponing death that he dared once to revive a dead man. As punnhment for his effrontery, Jove cut short his supposedly immortal afe with a thunderbolt

As frar of spirits wanted instances of allevel realities with appeared among the Greeks and Hebrews Emperiodes, a Greek philosopher of the fifth century before Christ, is reputed to have revived a dead woman simply by bidding her to rise, and Apoltonius of Tyana, a mystic who lived just belone the Christian era, resincitated a young pirl in dramatic fashion as she was being borne to the funeral pyre. The Hebrew prophet Elisha raised the son of the Shunammits woman by beenthing into his mouth and praying over bim. In the New Testament, accounts of simdar incidents are numerous.

DURING the Middle Ann, men believed carneally in the power of the Christian same to restore life. St. Francis of Paula, in the fifteenth century, achieved the distinction, according to contemporary accounts, of twice raising the same man from the dead. In chopping down a tree, the man one day misjudged the angle of the tree's fall and was caught beneath its bole and crushed to death St. Franas revived him. Determined not to run further risks of the kind, the man unluckily chose to become a steeplejack. He süpped from a steeple and crushed to the ground, killing himacif a second time. Again St. Francis restored him to life

in modern times actual restoration of life has come to be regarded as an impossibility. Many scientists regard Dr. Cornish s intention to apply his methods to n man at fantasts. and may be cannot succeed. Besides many legaand moral obstacles stand in the way of such an audacious undertaking. Yet results to date have been incredible. They have quieted many tears and have shed new light on some of the mysteries of death. Science seems determined. si not now then some day, to cheat the grave.

#### SCIENCE TURNS HOCKEY INTO BIG BUSINESS

(Continued from page 52)

minor leagues organized as "feeders" for the hig-time circuits, professional hockey has en-

tered the realm of Big Business.

Called "Spott's fastest growing boy," it promises to dot the country with rinks. For, with the latest systems of speedy refrigeration, ice hockey is possible in southern in well as in northern states. In fact, one active league on the West Coast has its center in Los Angeles, in Southern California.

George C. Funk, Boston ite engancer who built the first modern rinks in that and other sarge American cities, and James E. McNady, veteran superintendent of Madison Square Garden, are largely responsible for the advance. It was McNally who devised the highspeed system of disposing of the ice after a game which has made bookey possible in arenas like the Carden

On a sangle week's schedule for such an auditorium there may be a prize fight, a flower show, a track meet, a symphony concert, a motorboat exhibit, and a pageant with hockey games sandwiched in between. The ace for the matches has to appear and disappear as though by magic.

EVEN before the last straggler has left the Garden on the night of a bockey game, McNally's magic begins to work. The brine, which has been running through the inch-anda-quarter pipes at a temperature of fifteen degrees F., is passed through a steam beater, Its temperature rises to seventy degrees and in a few minutes the lowest layer of the ice, next the concrete, is metted.

Motor-driven plows then head across the floor ripping up strips of ice a yard wide and knying them, as fragments, in long windrows behind. Other electric-powered machines follow and shove the windcows into pilm. Then workmen shovel the ice down a trapdoor into a giant underground val. Here, the fragments mell and the water flows away into the sewage system of the city

To hasten the drying of the concrete, the scrapers are fitted with heavy rubber aqueegees which drug behind and wipe up the moisture. In thirty to outes, the ice, which tonk three hours to freeze, has disappeared and the concrete is practically dry. In some instances, a bockey game is played in the afterpoon and then the floor is cleared and a prize fight is held in the evening.

It is this rapid-fire appearance and disappearance of the ice that makes the indoor guess practicable for large cities. The system behind it is engineering's gift to bockey, a gift that is making the exciting game of spills and thrills enjoyed by increasing thousands of

#### DAUGHTER OF MME. CURIE CREATES A NEW ELEMENT

CREATION of an absolutely new radioactive element was reported recently to the International Conference on Physics at London by Mme, Irene Curie Johot, daughter of the late Mme, Curie, and her husband Jean Frederic Joliot. The new element, called radiomitrogen, was created by bombarding boron with alpha rays. After the bombardment, the transmuted boron emitted radium energy for fourteen

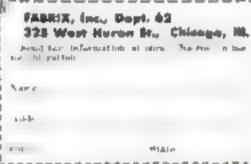
#### COPPER VASES KEEP FLOWERS FRESH LONGER

Cur flowers stay fresh longer in copper jara or vases, recent experiments have shown, Copper, minute quantities of which dissolve from the vase in the water, retards the growth of bacteria which cause dowers to decay, experimenters say in explanation,



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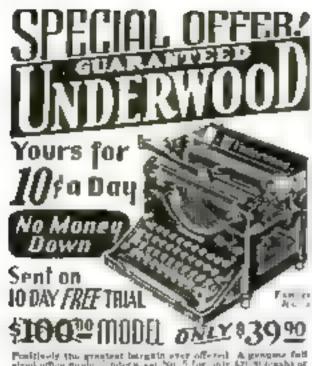
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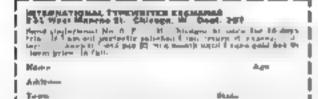
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#### HERE'S THE ANSWER

(Continued from page 19)

twenty-five to forty miles on hour while its whirling winds reach speeds of from 300 to 500 miles an hour

#### Count 'Em And See

D. T., MEMPHIS, TEXM. About three quintahon electrons flow through the average fifty-watt incandescent lamp every second it is lighted.

#### Sea Air and Ocone

J. L., aantimore, 340. Although popular betief credits the bracing effect of a sea breeze to the ozone contained in the ocean air science proves otherwise. Tests have shown that little ozone is contained in either land or sea air

#### Sound Speedier In Water

T T., SALT LAKE CITY, UTAEL Strange as it may seem, sound travels four times faster through water than it does through air. In water, sound waves cover 4,780 feet in one second, while in air, at normal temperature, they travel only 1,060 feet a second.

#### Clinkers Not Staker's Fault

Q .- wittes chokers form in a furnace, bu't it a sign that the fire is not being stoked properly?-K. D. C., Newark, N. J.

A .- not necessarily. Clinkers are merely fragments of ash that have been fused into lumps by the heat of the fire. Some kinds of coal leave an ash that is more fumble than that left by others,

#### Earth Like Onion

W B. G., LOUISVILLE, MY It has been estimated that the so-called "outer crist" of the earth is slightly more than twelve miles thick. This surface layer is one of four distanct shells enveloping the earth's 2,200-milediameter tote

#### Sulphuric Acid Popular

G. K. L., power, S. J. Sulphuric acid rates next to water as the most-used liquid in the chemical codustry

#### Rocket Fuel

P. K., LOUISVILLE, BY Gasoline and liquid oxygen form the fuel for most experimental rockets. The liquid oxygen is necessary to support the rapid combustion and the hand og of it presents one of the major difficulties of rocket work. To keep it liquified a tempera-ture of 125 degrees below zero Centurade must be maintained, making it necessary to use special containers. Above this temperature, the fiquid oxygen boils vigorously, giving off large quantities of oxygen gas.

#### How Old Is Coal?

F D., ju., new york, n. Y It is believed that coal was mined and used by the Chinese over 2,000 years ago, Even at the present time, the coul fields of China are probably the largest in the world.

#### Air Pressure on Everest

J. U., austors, mass. At the top of bit Everest, some 29,000 feet above the sea, the air pressure is about four pounds to the square unth or about one-third the pressure at sea level.

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#### DOES YOUR CAR NEED NEW PISTON RINGS?

(Continued from page 60)

sumption. It had no power. You could hear the blow-by It had no compression, used lots of gas, and the spark plugs were always fouling. St.ll, the customer swore he never had to buy a quart of oil from one oil change to the next "

"How do you account for that?"

"Only one thing could cause it," Gus replied. "Gasoline was leaking down past the pistons just as fast as the oil was being burned, so it sort of struck a balance. After the first few hundred much with new oil, that motor was being hibridated with a weak mixture of gas and oil, but the car owner didn't know that "

"YOU wouldn't think enough gusoline could get by the pistons to make that

much difference, ventured Landon
Gus granned, "You'd be surprised. Why, I ve seen cars that were much worse than that One buggy passed so much gasoline that you just about had to ball the crankcase out to keep it from overflowing. You may not believe it. but the crankense mixture would gain as much as a quart in a hundred miles."

"Well, one thing sure, if a cur uses lots of oil it's a pretty good sign it can stand a ring

ob, fan't it?" insuted Landon.

"Yes and no again, Stuck rings or rings with their gaps in line will run of consumption up, to say nothing of what crankcase leaks will do. It's the same way with poor compression. Rad rings cause poor compression, but poor compression doesn't always mean that the rings are bad. A loose cylinder head, a bad guaket, worn valves, or wrong valve adjustment will hall compression just as fast as leaky rings.

"A few minutes ago you asked if fouled plags meant worn rings. Sometimes they do, and sometimes they don't. Poor ignition or bad plum will foul the points just no fast as oil leaking by the rings, and still I've seen plenty of oil-pumpers that never fouled a

plug.

Landon wagged his bend, "Gosh, at that rate it's pecity hard to know when a carneeds new rings and when it doesn't

"Oh, it's not so bad. Only you can't count too much on any one age, When your car really needs new rings, you'll know it. The first sign of trouble will be when she loses power and maybe develops a bad miss at low speed. About that time you'll notice that you have to buy more gas than you used too, and chances are your oil bill will start to go up. Then you'll notice that your exhaust smokes, not just when you start in cold weather or when you speed up after coasting down a hid, but all the time"

"Is there ony sense in trying to use heavier oil to make up for word rings?" asked

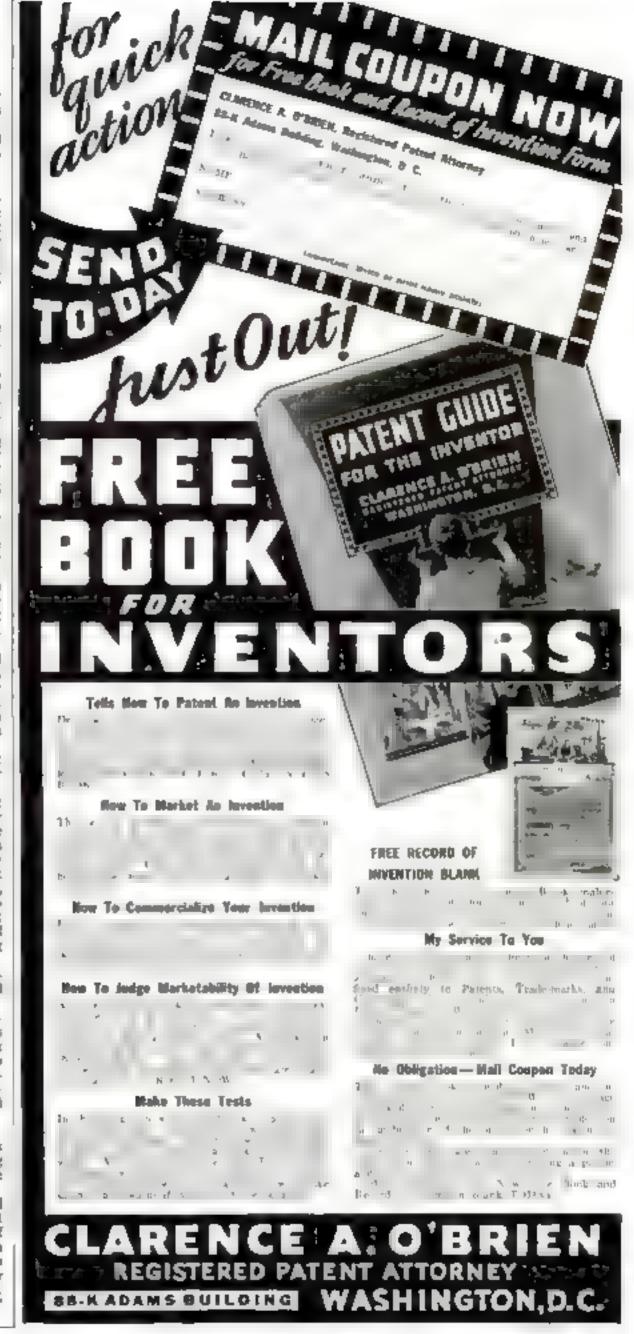
Landon.

"You can't make all take the place of metal. The only thing a beavier of will do is waste gas. Once the rings are worn nothing will do any good but a first-class ring job with new platon pine, a check-up on the connecting rock, new pistous and a cylinder refinishing if they're needed, and a general tightening up of the bearings."

Y THIS time Gus had finished his work D on Landon's cur and the owner sat idling the motor while Joe Clark pushed open the

garage doors.

"You know," Gus sighed as Landon piloted he car out through the draveway. "I've sort of changed my mind about that fellow. If more owners were on the lookout for worn rings we'd have lots less trouble trying to put pep back into cars with scured cylinder walls, burned pistons, and buttered bearings. That would save everybody a lot of gnef."





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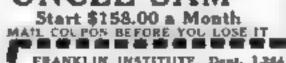
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# FRANKLIN INSTITUTE, Dopt 1.244 Rochester, N. Y. Back to me unchant starge copy of Eropane II as a Cont of Gorgenmen John with participal and partition of the local in Sel Address

#### HOW RADIO STARS HEAR THEMSELVES

(Continued from page 36)

sponsor after he had beard records made from broadcasts in the East, A story with a reverse twist comes from another studio. An advertising agency ordered records of a certain program. It wanted to play them for the sponsor to demonstrate how had the feature really

To any list of unusual recording orders must be arided one that helped a young dramatist break into the New York radio market. He had submitted script after script and they all came back. Some of them, he thought, had not even been read. So he went to a recording studin, had one of his skits turned into a record and sent this to the broadcasting company. It was accepted almost at ouce-

A MONG the radio stars, the best customers for the recording laboratories are Gladys Swarthout, Rudy Vallez, Lawrence Tibbett and Tom Howard. At one time, Jack Arthur was Number One customer. He was appearare on eighteen programs a week and had them all recorded.

Arrangers, the musical experts who prepare the scores for popular orthestras, are among the stendiest patrons of the laboratories, They have the programs recorded and then cut out their arrangements of the bit includies to sellto other leaders. As there are thirty or forty of these crack arrangers in the game, their ordem often keep the recording turntables upinning for hours at a time

Hen Bernie is said to have originated another use for recorded orchestra programs After every broadcast, for a time he made it a practice to go over the records with his cousiesans, pointing out flaws in technique, un if he had them letter perfect

Similar sessions are now being held by some leaders before they minute on the air. In fact, "B B.," or before-broadcast recording is one of the fastest developing features of the work at the present time. Artists are making and recording test broadcasts as part of the preparation for a program. Tom Howard, for example, will never appear on the alr. without making a record beforehund to tee that everything is O K

Several months ago, a family of noted musicians and singers were babyhoose for weeks before they made their debut on the radio. Thousands of dollars were spent in advertising them. Then, their program was a flat fulure. The radio chaped the huber cycles of their music and failed to carry the very feature which pave it its distinctive character in the concert hall. A few dollars spent for H H records would have shown just what listeners would hear and would have avoided the loss and disappointment that resulted.

N CONTRAST, take the preparation Joe Cook made for her first appearance on the air. He worked for days at a time making test broadcasts and studying the records. By the time he reached the mike, he knew exactly how his program would sound and had developed a radio technique best fitted to his type of humor. And his first broadcast was a strash success

Sometimes, for test records, experts use theap getatine disks. The only recommendation for them, however, is their low cost. They are temporary makeshifts and are unsatisfactory either for filing or for prolonged

What is shead for radio recording? It is still in the early stages of its development. But its sensational rise in recent months has been an outstanding event in the broadcasting world. Already, it has some far in producing a revolution in microphone technique which promises to bring better programs to the air



#### LARGEST BRIDGE RESTS ON SUNKEN SKYSCRAPERS

(Continued Jeum page 23)

two traffic levels. To the eastward, traffic will pass over a short length of viaduct and next over a cantilever bridge Beyond it will crossfive successive truss spans and finally a concrete viaduct From Rincon Hill in San Francisco to the east shore of the bay the bridge will be eight and one-quarter miles long. It Will cost \$77,000,000

The decks of the suspension bridges will be 214 feet above high water and the towers will rise into the air 505 feet. Towers of this height away surprisingly in the wind and engineers have spent many days stop the towers peering down on large ruled squares of paper observing the movement. They have found that one tower will bend over three feet white loaded.

THE cables, far too heavy for any mach ne to lift, will be spun on the towers. Two cables will stretch from the anchorace on the San Francisco above to the pile of concrete in mid-channel, whence another pair will reach to Yerba Buena. The method is much the same as that used by a spider in spinning his web. A shuttle wheel will carry a single loop of one-fifth-such wire from one anchorage up over the towers and book it into a strei eye in the anchorage opposite. The process will continue until the 17,464 wires in each cable are struce

At each anchorage the wires will be separated into thirty-seven strands, each being fixed to an individual eve embedded in the concrete. The cubies, as seen by a traveler on the bridge, will be twenty-eight and onequarter inches in diameter, about twice as thick as the average telegraph pole

Each shore and torage whole not of the gipuntic proportions of the central pier, contains enough concrete or rock to construct an Egyptian pyramid. The huge weight is necmany to withstand the terrific pull of the cables. Each cable will. It is estimated, exert a pull of 18,000 tons, a force sufficient to move a train of 250 loaded freight cars. Into the bridge will go enough steel and concrete to build all the large office buildings in down town San Francisco. The timber used for false work and temporary shantles would raise enough dwellings to house a town of 15,000 population

These figures refer only to the Bay Antice From the north side of San Francisco, anofficer bridge is to cross the Golden Gate Its. central span, four-fifths of a mile between towers, will be the longest in the world

IN ERECTING the south tower of this re-markable bridge, engineers were confronted by what seemed insuperable difficulties. Water At this point is 100 feet deep and the sevenmue-an-hour tide which sweeps in and out of the Cate sometimes rolls up waves twenty feet high. It was impossible to the ordinary methods of underwater construction and mgineers had to resort to the unusually daring feat of sinking a "well" into water that is virtually open sea.

The well is an oval-shaped cofferdam, 750 feet wide along its longer axis. Built of steel sections bolted together it rises from the boltom to a height fifteen feet above high water Within the coffer dam, workmen pursue their tasks undisturbed by the rushing tides of the

Golden Gate

The cofferdam is located 3.100 feet from the southern shore of the Gorden Gate, and is connected with the land by a construction pier over which workmen and materials can be transported directly to the work

This pier and tower, when completed, will measure 346 feet from bedrock to the tip of the steel work, making it one of the world's tallest structures,

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Can You Answer these Questions?

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#### CONTENT WITH THEIR PRESENT INCOMES

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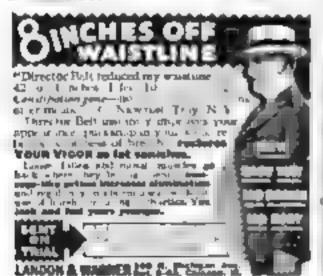
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#### SOLVING SECRETS HIDDEN IN WOOD

(Continued from page 15)

stumps which are supposed to be the remnants of trees which, when still above marked a kne of survey. If the surveyors had witnessed a point by means of a bused pane tree and the tree deed aller by sending an part of the stump one mucht gain information as to whether the stump in dispute was ready (and of 6-31

"beveral years ago, some specimens were received which had been taken to in the outtem of a rancoad cut fifty feet deep. This would which accurring to generality had been covered up by a glarier over MOADA years ago was it it would enough to be identhed as spruce. It had been builts trusted but the cell structure was still plainly visible uncler the macroscope."

MUSEUMS sometimes send in fragmenta of old wood. Recently Mass Griffin recrived a sliver of wood from an Egyptian mummy case estimated to be 3,000 years old The wood was identified as from the fig tree of Biblical Jame. In another instance, a backy decayed mere of wood from an Indian cance which had been recovered from Lake Minnetonka, in Minneapolis, was submitted. By cut ting off the end of the piece with a sharp knife, Mess Griffin was able, with the use of a hand lens alone, to identify it as white oak Recause their structure in cross sections is so distinctive, oaks, cims, maples, and some nther varieties can be identified without placung a section under a microscope.

A great deal of this work, however, requires the use of a high-powered aucroscope with which the shape, arrangement, and conh-uzation of the rells of which would is companel can be ascertained. The microscope frequently reveals decided differences in wood which could not be suspected from ordinary

observation.

The number of wood specimens submitted to the Forest Products Laboratory for iden-Discussion varies from day to day and from year to year, but there is hardly a day when the Laboratory does not receive a aperimen of some sort or other. As an indication of the extensive use already made by the public of the wood identification section, the smallest number received in one year has been 1,000 specemens. In the month of September, 1918. when the testing of war materials was at its height, over 3,000 pieces were passed upon This is the record month in the history of the office

Often the wood technologist is called upon to settle disputes of a commercial nature. During the building of a railroad line, the railroad's contract called for white oak ties. with Mrsct matructions for every red oak Be to be thrown out. Acting upon these ustructions, and believing that they were detecting the forbiddes red oak ties, the laspectors threw out almost every other tie. Finally, several of the rejected ties were sent to the Forrsi Penducis Laborar ses. In a few days he reply came back that the specimens had been carefully examined, and that in each case they

were of white oak

O's one occasion a mad under house or quested examination of a same number of mounten articles in writer to be sure had tiese articles had been correctly described in its cat-#112UP

Small slivers of wood from various pieces of furniture are frequently sent in for ideninfication. The best method of getting a sample without defacing the piece of furniture is to take a sliver of wood from under the bun-re-

Pipe-smokers often want to make sure that their pipes are of real French brian, for certaus woods, particularly mountain laurel, are sometimes used in place of French briar which they closely resemble. Slide rules and other scales supposed to be made of buswood are often submitted. These are sometimes made of species which are coarser grained or otherwise inferior to genuine Turkish borwood. Wooden portions of airplants which have had disastrous accidents are also submit ed

Landscape architects, in restoring old gardens, have often made use of the wood identification service. A piece of wood from an old tree found on land that had once been part of Washington's Mount Vernon estate was sent in, and found to be honey locust

AST March the Laboratory received for iden- Infication four pieces of wood taken from the buildings which are duplicates of the famous Hooden Temple at Nils, Japan, built on the Wooded Isle in Jackson Park, Chicago, for the 1893 World's Columbian Exposition. These were being restored, All of the wood parts used in the original construction of these buildings had been fabricated and ausembled in Japan, then carefully marked and shipped to Chicago, and reassembled in Jackion Park by the same workmen. The experts at the Forest Products Laboratory were able to state that the first three specimens were of a species of true fir, while the other specimen was of Japanese sugi wood

knute Rendahl, a noted violin maker living in Maduon, Wis., made a violin which he later presented to Fritz Kreuler. He wanted to obtain more wood of the kind he had used for that violin, and on submitting some remnants of it to the Laboratory, learned that it was Sitka spruce—a species highly esteemed for fine structural uses, as in airplane construction, but not bitherto considered as suit-

able for violin making

Curiosity is often the motive that prompts per sie to send an wood some mens. A treeit made up the tower of he courthouse in Greensburg, Indiana, has attracted to much attention that many people have sent in small branches that the wind has broken off. The tree, afteen feet in beight and with a trunk lour inches thick, has been theiring in its strange location for the last thirty-five years, and is said to be unparalleled in the world. Supposed to be maple, it has been identified as poptar at the Forest Products Laboratory,

A stick which had be end braided into a whip was sent to the Laboratory, and was identified as wood from the Lacebark tree. This is a small tree or shrub growing chiefly na lunestone rocks throughout the West Indies. The isner portion of the bark consuts of many than laminations which readily separate and are strikingly similar to fine lace

VEN fushion has an influence on the kinds of articles received for examination. Wooden brein for women's shoes are often coneived to Miss Griffin's mad. She explains that maple is considered the best wood for heel purposes, although birth is occasionally used. The requirements for wood used in shaped heels are extremely exacting, and sometimes the manufacturer has difficulty in shaping it In such cases he sends the material in for idenafication, in order to determine whether be has actually received the kind of wood he or

Both Kochler and Mea Griffin find that wood identification has a fascinating variety Kochler's intensive research in wood usually keeps him so busy that he has little time for outside interests, but sometimes when his day's work at the Laboratory is over he returns to the fully equipped basement workshop in his home, where his hobby is—to

make things of wood!

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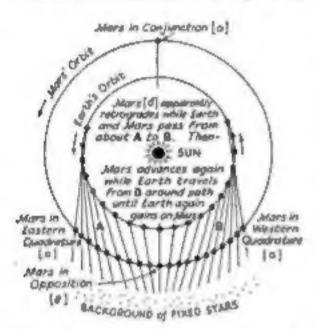
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# A New Planet Finder You Can Make at Home

(Continued from page 33)

crosses the orbit of the earth, and mark the point with a pin. You now have the position of the earth in its orbit on May 1, 1955. It will be at 220 degrees.

Now note on the degree scale, at the bettom edge of the drum, the number which is directly under the Venus dot in the position it took on the sodiec after counting off 120



Why Mars "loops the loop." As the sorth praces Mars, that planet appears to hack up

days (twelve ten-day intervals) from its position on January 1st. Follow this same numbered degree line toward the sun, just as you did before, until it crosses the orbit of Venus. Mark this crossing with a pln. It will be at 136 degrees.

One more step and you will have the position of Venus which you seek. To find it, look straight down into the bottom of the cup, at the same time holding a roler across the top. Move the ruler until it connects the points marked with the pins. Then follow the edge of the ruler with your eye, from the pin mark on the earth's path through the pin mark on the path of Venus, and beyond, until the ruler edge meets the edge of the transparent drum. While still sighting this point on the drum, bring the Venus ring around untill the white Venus dot is in line with the point where the ruler meets the drum's edge. This shows you the place in the godine where you should look for Venus on May 1, 1935, It should be in the constellation Taurus a few degrees east of the bright star Aldebaran, which is the eye of the bull.

By counting off on a yearly calendar the correct number of days from January 1, 1935. and then moving each planet dot the equivalent number of ten-day intervals (or yearly intervals in the case of Jupiter) you can locate the keliocentric position of any planet at any time to the future. And when the beliecentric position is found, the geocentric position (the apparent position as seen against the constellations from the earth) is easily found, as already ladicated, by making a line with

pins and ruler.

If you carry out this operation with the planet Mars for each of the fourteen ten-day intervals from February 1, 1935, to May 19, 1935, and mark down the geocentric positions upon a chart of the constellation Virgo, or the Virgin (see one of the diagrams) you will note that the apparent position of Marsin the constellation travels westward instead of eastward during this entire eighty-one days. Then it becomes stationary, and moves for-ward until it has regained the point from which it "retrograded." This point will be regained in about sixty-three days. Accordingly, Mars spends 144 days, or four and

eight-tenths months in forming a backward and forward loop. The rest of our solar year it progresses steadily eastward among the sodiscal constellations

A glance at the diagrams will explain the retrograde motion of Mars easily. Its orbit s outside that of the earth, and the ruddy planet takes two of the earth's years to traverse its circuit. Accordingly, the earth must catch up with and pass Mars once during each circuit of twelve months.

At these times, the same effect occurs which is even when a railroad train in which you are riding passes a slower train moving in the same direction on a parallel track. As your train catches up with and passes the other, the slower train seems to stop, and then to move backward across the landscape

Think of Mars and the earth as trains on parallel tracks. As the earth catches up with and passes Mars, the latter seems to go slower and slower (relative to its background constellation of the zodiac) and eventually stops, At the centre of this motion the almanac describes the event in the words, "Mars in opposition," which simply means that Mara, the earth, and the sun are in line, with the sun and Mars in opposing positions.

But, as the faster-moving earth continues on its track, Mars apparently falls behind or "retrogrades" on its track. It seems to us to be moving backword among the stars along the ecliptic, or what we call the race track

of the planets.

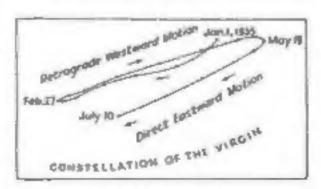
The almanac records the beginning of this movement in the words: "Mars stationary," and its end, about eighty days later, again by the words: "Mars stationary." After this sec-ond stationary point is reached and passed, Mars again moves forward among the todiacal constellations until the same situation occurs again as the earth again catches up with and passes its neighbor planet in their perpetual race.

This same loop is also formed by the path of Venus, except that in this case Venus is the faster train, and (because its orbit lies within the earth's) Venus gets in line with the sun and disappears for a time in his blaze of light. A moment's study of the diagram will make it clear how Venus, while getting into and out of line with the earth and sun, changes from an "evening star" (visible after sunset) to a "morning star" (visible before sunrise). It also explains why Venus is never seen more than forty-seven degrees from the sun.

During 1935, Venus will become stationary and begin its backward movement about Augest to, and will retrograde for forty-three days. Then, on September 27, it will again become stationary and resume its direct motion for the rest of the year.

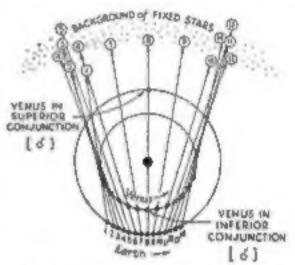
'HE diagrams showing the retrogression of Mars and Venus indicate, in addition, the symbols and terms used in almanacs to indicate the different positions and motions of the planets.

These symbols form a sort of "astronomers"



Path of Mars in its loop from January 2 to July 10, 1935. The dots are ten-day intervals

shorthand"-a brief, convenient way of describing the activities of Old Sol's family throughout the year. This information is given in almanacs under the heading "Planetary Configurations," and it is interesting to be able to understand the symbols and visualize at once the cosmic happenings for which they stand. With this knowledge, you can avail yourself of the information to be found in almanacs and other sources.



How Venue changes from morning to evening war and why it is always cosu mear the sun

Mercury is here left out of consideration, because it moves so rapidly and is in view such a short time after sunset and before sunrise that many people never see it at all. However, if you wish to follow this "artful dodger" of the sky, any almanac will tell you when to watch. Look for it on the date opposite the words, "Greatest Elemention (East and West), "East" in this connection means (rather strangely) in the masset sky; and "west" means in the sunrise sky.

Here are some of the other characteristics by which you will be able to recognize the

various planets:

Venus is brighter than any fixed star or other planet. Its color is dazzling white. It is never visible all night and never appears higher in the sky than forty-seven degrees from the setting or rising sun. It moves more rapidly along the zodisc than any other plan et except Mercury.

Mars is of a distinctly reddish bue, and is very bright at and near "opposition," It may be seen at any point along the diurnal arc of the sky, and can be seen all night at its

opposition with the sun.

TUPITER is the brightest planet except Venus (or Mars during a close opposition). Its white color, however, always distinguishes it from Mars. It moves through only one constellation a year, and can be seen all night when in opposition with the sun,

Saturn is of a dull yellow color, and is never as bright as the other naked-eye planets. It moves through only one constellation in two years, and can be seen all night when in opposition with the sun.

Uranus and Neptune can be followed only if you have a telescope with which to ob-

serve them.

Venus and Mercury are "evening stars" from "superior conjunction" through "eastern elongation" to "inferior conjunction." They are "morning stars" from "inferior conjunction" through "western elongation" to "superior conjunction,"

Mars, Jupiter, and Saturn, are "evening stars" from "opposition" through "eastern quadrature" to "conjunction." They are "morning stars" from "conjunction" through "western quadrature" to "opposition."

CHARGOSTRONA



